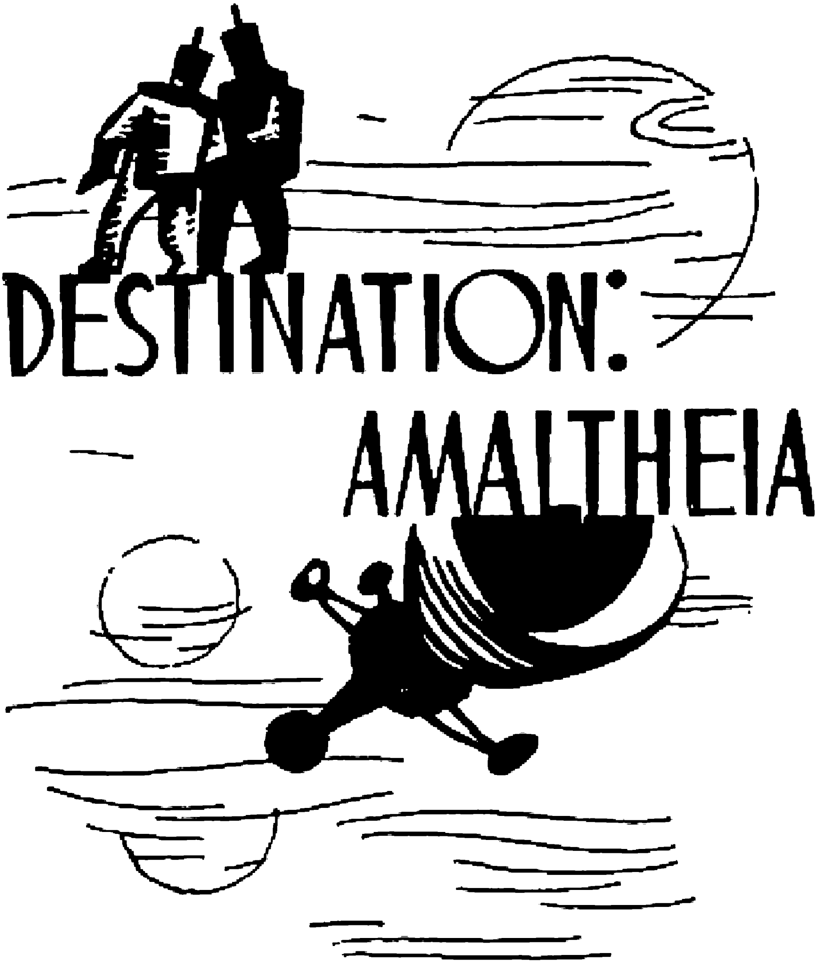
DESTINATION: AMALTHEIA

DESTINATION: AMALTHEIA



FOREIGN LANGUAGES PUBLISHING HOUSE
MOSCOW

SCIENCE-FICTION AND ADVENTURE LIBRARY

DESTINATION: AMALTHEIA

Translated from the Russian

BY LEONID KOLESNIKOV
EDITED BY RICHARD DIXON

DESIGNED BY NIKOLAI GRISHIN

FOREIGN LANGUAGES PUBLISHING HOUSE
MOSCOW 1962

CONTENTS

The Astronaut *by Valentina Zhuravlyova*

Over the Abyss *by Alexander Belyaev*

The Maxwell Equation *by Anatoly Dneprov*

The Valley of the Four Crosses *by Igor Zabelin*

The Golub-Yavan *by Kirill Stanykovich*

Flying Flowers *by Mikhail Vasilyev*

Deatination: Almatheia *by Arkady and Boris Strugatsky*

THE ASTRONAUT

by

Valentina Zhuravlyova

Valentina Zhuravlyova (b. 1933) received her training at a medical institute. She was probably prompted to try her hand at scientific fiction by almost fantastic possibilities offering in the field of medicine.

The reader will particularly enjoy the bold flights of fancy in her scientific thinking. “The Astronaut” – 1960 – is one of her latest creations.

“What can I do for these people?” shouted Danko in a voice that drowned the thunder. Suddenly, he clutched at his breast, tore it open, plucked out his heart and held it high above his head.“

Maxim Gorki

I think I should begin by explaining in a few words the reason that brought me to the Central Astronautics Archives. My story might otherwise seem incomplete.

I am a spaceship physician with three astro-flights to my credit. My subject is psychiatry, or rather astropsychiatry, as it is called nowadays. The problem which I am working on at present first arose years back - in the 1970s. In those days flights to Mars took over a year, to Mercury just under two years. The engines only worked at take-off and touch-down. No astronomical observations were carried out in flight - sputnik-mounted observatories did that. So what could the crews do during those long months? Practically nothing. Forced inactivity led to tension, to nervous breakdowns and mental disorders. No amount of reading or listening in could make up for what the first spacemen lacked on board ship. For what they lacked was work - the hard, creative work to which they were accustomed. It was then that the principle of hobby-minded personnel selection was first advanced. The nature of the hobby, it was thought, was entirely immaterial, so long as it gave the astronaut something to do during the flight. And thus we got pilots who had a passion for mathematics, navigators keen on ancient manuscripts, poetry-writing engineers, etc.

There was a new entry in the astronaut's certificates, the famous item 12: 'Interests other than professional'. However, a break-through in rocket technology soon provided a new solution of the problem. Ion engines cut travel between planets to a few days. Item 12 was dropped.

Some years later, however, the problem reappeared with a vengeance. Mankind had mastered interstellar travel. Yet though the speeds of ion rockets were eventually stepped up to suboptical, journeys to even the nearest stars took up to twenty years . . .

Item 12 was back in the flying certificates. In terms of actual rocket control crews were occupied no more than 0.001 per cent of flight time. TV faded away a few days after blast-off, radio lasted another month. And there were still years and years ahead . . .

Rockets were manned by crews of six to eight in those days, not more. Tiny cabins and a 150-foot-long greenhouse were all the living-space they had. It is difficult for us who fly in interstellar liners to imagine how people in those days did without all these gyms, swimming pools, stereo-theatres and promenade galleries.

But I have digressed without beginning my story.

I don't know, haven't yet had time to find out who it was that designed the Archives buildings. But he was obviously a highly gifted architect. Gifted and daring. The buildings rise on the shore of a Siberian reservoir sea which was formed twenty years ago when they dammed the Ob. The main building stands on a high shore. I don't know how it was done, but it seems to soar above the water, a white pile looking like a schooner under a full press of sail.

Altogether there are fifteen people at the Archives. I have already met some of them. Most of them are here for short spells. An Australian writer is collecting material about the first interstellar flight. A scholar from Leningrad is studying the history of Mars. The diffident Indian is a famous sculptor. Two engineers - a tall strong-faced young man from Saratov and a small polite Japanese - are working jointly on some project. What kind I don't know. The Japanese smiled politely when I asked him about it. 'Oh, it's an absolute trifle. Not at all worthy of your high attention.'

But I am digressing again, when I should really be beginning my story.

I came to the Central Astronautics Archives to look into the history of the 12th item, which I needed for my research.

I spoke to the director the first evening. He's a man still in his prime, who all but lost the sight of both his eyes in a fuel-tank explosion aboard a rocket. He wears glasses of some special make - triple-lensed and blue-tinted. His eyes are not visible and it seems the man never smiles.

'Well,' he said, having heard me out, 'I think you should start with Sector 0-14. Oh, excuse me, that's a system we use here; it doesn't mean anything to you, of course. I meant the first' expedition to Barnard's Star.'

To my shame I knew next to nothing about that expedition.

'Your flights were in different directions,' he said with a shrug. 'Sirius, Procyon and 61 Cygni. And all your research so far has been on flights to those stars, hasn't it?'

I was surprised that he should know my record so well.

'The story of Alexei Zarubin, Commander of the expedition,' he went on, 'will provide the answers to some of your questions. You will have your materials in half an hour. Good luck.'

The eyes were invisible behind the blue-tinted lenses. His voice sounded sad.

The materials are on my desk. The paper is yellow with time; the ink on some of the documents (they wrote with ink in those days) has faded. But their meaning is not lost: there are infrared copies of all the documents. The paper has been laminated, and the sheets feel hard and smooth.

Through the window I can see the sea. Its breakers roll in ponderously ; the water rustles up the shore like pages being turned . . .

An expedition to Barnard's Star in those days was a hazardous adventure. The star is six light-years away from the Earth. The rocket was to fly half that distance under acceleration, and half under deceleration. The journey there and back was expected to take just under fourteen years.

For those aboard the rocket the time would be slowed down to only forty months. Not too long, it seemed. But the danger was that for thirty-eight out of those forty months the rocket engine was required to work at full blast.

The rocket had no fuel reserve - an unwarranted risk, one would think nowadays, but there was no alternative then. The ship could take no more than what the tightly calculated fuel tanks carried. Therefore any delay en route would be fatal.

I read the minutes of the selection committee. One after another the candidates for captain were turned down. And no wonder. The flight was to be exceptionally hard, the captain had to be an excellent engineer and combine a level head with reckless courage. Then suddenly everybody was unanimous.

I turn a page. The service record of Captain Alexei Zarubin.

A few minutes and three pages later I realise why Alexei Zarubin was selected captain of the *Polus*. In a truly amazing way the man combined 'ice and fire', the calm sagacity of a scholar and the fiery temperament of a fighter. That was probably why he had been entrusted with the most daring ventures. He seemed to have the knack of overcoming insurmountable obstacles.

The committee selected the captain. As tradition decreed, the captain picked his own crew. But what Zarubin did could hardly be called picking. He just contacted five astronauts who had crewed with him before and asked whether they were prepared to undertake a risky flight. With him, yes, they said.

There are photographs of the crew in the materials. Black and white, two-dimensional. Captain Zarubin was twenty-six then, but he looks older in the photo. A rather full face with high cheek-bones, tightly-pressed lips, a prominent aquiline nose, wavy, soft-looking hair and unusual eyes - calm, seemingly lazy, but with a daredevil flicker lurking in the corners.

The others were even younger. Two engineers, a married couple, photographed together because they always flew together. The navigator with the meditative look of a musician. A stern-faced girl doctor and an astrophysicist, his eyes stubborn in a face patchy with deep burns, the results of a crash landing he had made with the captain on Dione, a satellite of Saturn.

An expedition to Barnard's Star in those days was a hazardous adventure.

Now for item 12. I thumb the pages and see the pictures have told the truth. The navigator is a musician and composer. The stern-faced girl is keen on microbiology, a serious subject. The astrophysicist is learning languages; he has already mastered five and now thinks of tackling Latin and Ancient Greek. The engineers are fond of chess, the new kind - with two white and two black queens and an 8i-square board.

The captain's hobby strikes an odd note. It's unusual, unique, I have never heard of anything like it. He's been keen on oil-painting since he was a boy. That is understandable, for his mother was a professional painter. But the captain seldom takes up his brush, he's interested in something else. He yearns to rediscover the lost secrets of the medieval masters - the composition of their oils, the way they mixed and used them. He carries out chemical research as he does everything he undertakes - with the devotion of a scholar and the ardour of an artist.

Six different people, six different personalities and backgrounds. It's the captain who welds them together. They love him, they trust him, they even imitate him. So all of them know how to be freezingly calm and recklessly risky.

The blast-off for Barnard's Star. The atom reactor works without a hitch, letting out an even, invisible stream of ions. The ship flies under acceleration. It is hard at first to work, even to move about. The girl doctor makes everybody stick to a fixed regimen. Gradually the astronauts settle down to the flight conditions. The greenhouse is assembled, then the radiotelescope. Normal life begins. Control of the reactor and other mechanisms takes up very little time. Everyone has to devote four hours a day to studies in his own field. The rest they spend as they think fit. The serious-minded girl is devouring monographs on microbiology. The navigator has composed a song which is quite a hit. The engineer couple sit for hours over the chess-board. The astrophysicist wades through Plutarch in the original.

There are brief entries in the ship's log: *The flight is proceeding normally. The reactor and mechanisms operate faultlessly. Spirits are high.* Then suddenly an anguished entry: *Telecommunication has gone dead. The rocket is beyond reach now. Yesterday we watched the last telecast from the Earth. How hard it is to see one more link severed!* Days later two more lines: *Have perfected the reception antenna of the radio. Hope to be able to carry on reception for another seven or eight days.* And they were happy as could be when the radio actually worked for another twelve days.

Building up speed, the ship swept towards Barnard's Star. Months went by. The atom reactor worked with utmost precision. The fuel was consumed strictly as precomputed, not an iota above.

The catastrophe came unannounced. One day, when they were over seven months out, the reactor's operating condition changed. A side reaction had sharply stepped up fuel consumption. There was a brief entry in the log that day: *Have no idea what has caused the side reaction.* They did not know in those distant days that infinitesimal admixtures in the atomic fuel could sometimes make all the difference between a controlled and uncontrolled reaction.

The sea grumbles outside the window. The wind has picked up and the breakers no longer rustle but hiss angrily as they pound the shore. A woman's laughter wafts in to me. But I mustn't let myself be distracted. I can almost see those six in the rocket. I know them - I can imagine what they were going through. I may be wrong in some details - what does it matter? But no, I am even right in those. I feel certain everything happened as I see it.

A brownish liquid boiled frothily in the retort. The brownish steam passed through a coil pipe into the condenser. The captain was peering at the dark-red powder in a test-tube. The door opened. The flame wavered and danced. The captain turned his head. Framed in the doorway was the engineer.

He kept control of himself but his voice betrayed him. It was loud, unnaturally firm and altogether not his usual.

'Take the load off your feet, Nikolai,' the captain said and pushed a chair forward. T did those calculations yesterday with the same result.

Come on, sit down.'

'What shall we do?'

'Do?' The captain glanced at the wall clock. 'Fifty-five minutes to supper. Enough time to discuss it. Please let everybody know we'll be having a conference, will you.'

'Very well,' the engineer replied absently. 'I'll let them know. Yes, of course.'

He couldn't understand why the captain dawdled. The ship's speed was increasing with every passing second; some kind of decision was imperative and urgent.

'Look at this,' the captain said, passing him the test-tube. 'You might be interested. It's cinnabar. Makes a devilishly attractive oil. But tends to darken when exposed to light.'

He explained to the engineer at some length how he had managed to produce a light-resistant cinnabar. The engineer shook the test-tube impatiently. There was a clock empanelled above the desk, which the engineer couldn't help glancing at: half a minute, the speed was a mile-and-a-quarter per second greater, another minute, another two-and-a-half miles per second . . .

'I'll be going,' he said finally. 'I must tell the others.'

Going down the steps he suddenly realized he was no longer counting the seconds or at all hurrying.

The captain shut the door tightly and put the test-tube casually back into the rack. He allowed himself a faint smile. Panic is after all a chain reaction. Which all things extraneous tend to slow down, he thought as he went back to his chair. The humming of the reactor cooling system filled his ears. The engines were busy accelerating the *Polus* flight.

Ten minutes later the captain went down to the messroom. The five astronauts rose in greeting. All of them were in astronaut's uniform, worn only on special occasions, and the captain realized there was no need for him to explain the situation.

'Well,' he said. 'It seems only I forgot to don the uniform.'

Nobody smiled.

'Please be seated,' the captain said. 'A council of war. Well now, let the youngest begin, as is the custom. You, Lena. What do you think we should do?'

He turned to the girl. She solemnly said:

'I'm a doctor, Alexei Pavlovich. And the problem under discussion is strictly technological. I will give my opinion later, if I may.'

The captain nodded:

'As you like. You're the cleverest among us, Lena. And, as a woman, the shrewdest, too. I'll bet anything you like you've got an opinion ready.'

The girl said nothing. 'Well,' the captain went on, 'Lena will speak later. Your turn, Sergei.'

The astrophysicist spread his arms in a gesture of indecision. 'This isn't up my alley either. I've got nothing pat. But I do know there's enough fuel to last us all the way to Barnard's Star. So why should we turn back when we're only halfway out?'

'Why?' the captain repeated. 'Just because once we're there we won't be able to come back at all. But we can now, when we're only halfway out, as you say.'

'I see your point,' the astrophysicist said thoughtfully. 'But, you know, we might be able to return after all. Not by ourselves, of course. By a relief rocket. They'll see we're not coming and they'll send one.

Surely astronautics is developing.'

'So it is,' the captain smiled wryly. 'With the passage of time. So fly on? Is that it? Good. Now you, Georgi. If it's up your alley, of course.'

The navigator sprang up, pushing his chair aside. ' Sit down,' the captain said. 'Sit down and speak calmly. Don't jump.' 'There can be no question of returning!' the navigator almost shouted. 'We can only go forward. Forward in face of the impossible. Why, how can we even speak of returning? Didn't we know from the outset the expedition was hazardous? And here we are, ready to turn tail at the first difficulty. I say, forward and only forward!'

'Well,' the captain drawled. Forward in face of the impossible. Beautifully said. Well, what do the engineers think? You, Nina? And you, Nikolai?' ' Nikolai glanced at his wife; she nodded and he began. He spoke calmly as if thinking aloud:

'The purpose of our flight to Barnard's Star is exploration. But if we six make some discovery it won't in itself have any value. It will have that only if and when mankind learns about it. If we reach Barnard's Star and have no means of coming back, what earthly use will there be in our findings? Sergei says a relief rocket will come eventually. I, too, think that is feasible. But those who come will themselves have made all the discoveries. What shall we have accomplished? What shall we have contributed to man's knowledge? Actually we shall only have brought harm. Yes, I mean it. Back on the Earth they will be waiting for our return. And in vain. If we turn back now only a minimum of time will be wasted. A new expedition will immediately set out. In fact we ourselves will. A few years may be lost, but then the data we've so far gathered will have been safely brought to the Earth. As things stand now there's no chance of that. So why go on? We two are against it. We must turn back. And now.'

A long silence descended. Then the girl asked:

'And what do you think, Captain?'

The captain smiled wistfully.

'I think the engineers are right. Beautiful words are still words. But the engineers appeal to common sense and calculation. We set out to discover. If we do not pass on our discoveries, they might as well not have been made. Nikolai is absolutely right . . .'

Zarubin got up and ponderously paced the mess room. Walking was difficult. The 3G-load brought about by the rocket's acceleration impeded movement.

'The relief-rocket variant is out,' he went on. 'But there are still two possibilities. The first is to turn back to the Earth. The second, to fly on to Barnard's Star - and still return to the Earth. Return in spite of fuel shortage.'

'How?' asked Nikolai.

Zarubin went back to his chair, sat down and said:

'That I don't know. Not yet anyway. But there are another eleven months of flight ahead. If you decide we should turn back now, we will. But if you will trust me to think up something in those eleven months that would pull us through, well then . . . forward in face of the impossible! That is the way I see it, friends. What do you say? You, Lena?'

The girl screwed her eye at him.

'Like any man, you're very cunning. I'd bet you've already thought up something.'

The captain laughed.

'You'd lose. I haven't thought up anything. But I will. I certainly will.'

'We believe in you,' Nikolai said. 'We do believe in you.' Then, after a pause, he added: 'Though, frankly, I don't quite see how anything could pull us through. There will be eighteen per cent of propellent on the *Polus*. Eighteen instead of fifty. But you said you'd think up something. So let's fly on. As Georgi says, forward in face of the impossible.'

The window shutters creak softly. The wind leafs through the pages, scours about the room, filling it with the damp smell of the sea. Smell is a wonderful thing. You don't have it on board ship. The conditions purify the air and keep up the required humidity and temperature. But conditioned air is as vapid as distilled water. All sorts of artificial smell devices have been tried, but with no success. The aroma of ordinary, earthly air is much too complex to imitate. Even now I smell the sea and the damp, autumn leaves, and, vaguely, some perfume, and sometimes, on a gust of wind, the earth. And wet paint, too.

The wind is leafing through the pages . . . What could it be the captain counted on? When the *Polus* had reached Barnard's Star her fuel reserve would be down to only eighteen per cent. Eighteen instead of fifty . . .

In the morning I ask the director whether I may see Zarubin's pictures.

'We'll have to go upstairs,' he says. 'But... tell me. have you read it all?'

He listens to my answer, nodding.

'I see. I thought so, too. Yes, the captain took upon himself a great responsibility . . . Would you have believed in him?'

‘Yes.'

'So would I.'

He is silent for quite a while, his lips quivering slightly. Then he gets up and goes through the motions of adjusting his spectacles.

'Well, let's go.'

He limps. We walk slowly through the long corridors. 'You will read about it yet,' the director starts. 'Volume Two, starting from page one hundred, if I remember rightly. Zarubin wanted to unravel the secrets of the Italian Renaissance masters. You see, oil-painting deteriorated starting with the 18th century - I mean its technique. A lot was thought to have been lost beyond hope of recovery. The painters could no longer mix oils that were at once bright and stable. The brighter the oil, the quicker it darkened. Especially the blues. Well, Zarubin . . . But you will see for yourself.'

The pictures hang in a narrow, sunlit gallery and the first thing that strikes me is that each is executed in one primary colour.

'These are studies,' says the director. 'To try out the technique, nothing more. This is "A Study in Blue".'

Flying side by side in a blue sky are two frail human figures, with strapped-on wings, a man and a woman. All is done in blue, and never have I seen such an infinity of shades. It is a night sky, raven black on the left horizon and a melting, midday blue in the opposite corner. The winged humans shimmer from the lightest blue to the deepest violet. The colours are brilliant, almost vibrant in some places, and subdued, transparent in others.

There are more pictures. 'A Study in Red': two suns above an imaginary planet, a chaos of chiaroscuro ranging from blood red to salmon pink. 'A Study in Brown': a fairy-tale forest.

The director is silent. I wait, looking at the blue-tinted, impenetrable glasses.

'Read further,' he says softly. 'Then I shall show you more pictures. Then you'll understand.'

* * *

I am reading as fast as I can. As fast as I can without losing the thread . . .

The *Polus* hurtled on toward Barnard's Star. The speed reached the maximum and the engines began to brake. Judging from the scant entries in the log everything was normal. No breakdowns, no sick aboard. Nor did anyone remind the captain of his pledge. And the captain was calm, confident and cheerful as always. He went on with his research and had done more studies.

What were his thoughts when he was alone in his cabin? Neither the ship's log, nor the navigator's diary give any answer. But here is an interesting document. The engineers' report. About the malfunctioning of the cooling system. Crisp, concise language bristling with technicalities. But between the lines I read, 'If you have changed your mind, friend, this is where you can turn back. With no loss of face . . .' And the captain's verdict across it, 'We'll do repairs on a planet of Barnard's Star', which means, 'No, friends, I haven't changed my mind'.

After nineteen months of flight the ship reached her destination. The dim red star had only one planet, almost the size of the Earth, but completely icebound. The *Polus* tried to land. But the jet of ions melted the ice and the first attempt failed. The captain chose another site, again the ice melted. Only at the sixth attempt did they manage to strike rock floor under a thin sheath of ice.

From that day the entries in the log-book were done in red ink. That was how discoveries were traditionally recorded.

The planet was a dead world. Its atmosphere was almost pure oxygen but not a trace of animal or plant life was found. The thermometer read 58° F. below zero. *A wretched planet,* the navigator wrote in his diary, *but what a star! Discoveries galore!*

And it was indeed so. Even today, when our knowledge of the structure and evolution of stars is increasing by leaps and bounds, the discoveries made by the *Polus* expedition have retained much of their value. The study of the gaseous envelope of the red dwarfs of the Barnard's Star type is still a classic.

The log-book. . . The scientific report. . . The astrophysicist's paper setting out a paradoxical hypothesis of star evolution . . . And, at last, what I have been looking for - the captain's order for departure. Still it comes as a surprise, almost a shock. Unable to believe my eyes, I hastily turn the pages. An entry in the navigator's diary. I see it all.

One day Zarubin said:

'That's all. Prepare for departure.'

The crew of five stared silently at their captain. The wall clock ticked away ...

* * *

The five stared silently at the captain. And waited.

'Prepare for departure,' the captain repeated. 'You know we've only got eighteen per cent of propellent. But there is a way out. First of all we must reduce the rocket's weight. All the heavy electronic gear will have to go, except for the controllers.' He saw that the navigator wanted to say something and waved him to silence. 'We've got to do it. Also all the partitions in the empty tanks, and some of the greenhouse sections. But that's not all. Fuel consumption is particularly heavy during the first months of flight - due to low acceleration, as you know. Comfort will have to be dispensed with: the *Polus* will depart to full 12 G's instead of three.'

'Flight control is impossible under that load,' Nikolai demurred. 'The pilot will not be able—'

'I know,' the captain cut him. 'I know. For the first months control will be done from here, from this planet. One of us will stay behind to do it. Keep quiet! Remember - there's no other way out. It's got to be done. Now, listen to this. You two cannot stay behind because you expect a child. Yes, I know. You are a doctor, Lena, and your place is with the crew. Sergei's an astrophysicist and will also fly. Georgi is too excitable. That leaves me. Don't argue. Everything will be done as I say.'

I look through Zarubin's calculations. I am a doctor and out of my depth in the maze of mathematics. But one thing is immediately obvious: the calculations were done to absolutely no tolerance, as it were. The rocket was stripped to a bare minimum and the take-off G-load was pushed up to a crushing maximum. The bigger part of the greenhouse was left on the planet and that carved deep into the astronauts' rations. The emergency power supply system with its two microreactors was also dismantled. As was almost all electronic equipment. If something untoward happened en route the rocket would be unable to regain Barnard's Star. *The risk is cubed,* the navigator wrote in his diary. And below, *But for the one who stays behind it's risk raised to the tenth, hundredth power . . .*

Zarubin would have to wait for fourteen years. To wait for the relief rocket. Fourteen years on an alien, icebound planet. . .

More calculations. Power was the prime thing. It had to last out the ground control period and the fourteen long years after. And again no allowance for emergency.

A photo of the captain's quarters, made out of the greenhouse sections. The transparent walls permit a view of the two microreactors and miscellaneous electronic equipment. The ground control antenna is on the roof. All round lies an icy waste. Aloft Barnard's Star shines coldly in a grey, murky sky. It is four times bigger than the Sun in diameter but little brighter than the Moon.

I turn over pages in the log-book hastily. My eye runs through it all the captain's parting advice, the arrangements for radio communicatior in the first days of flight, the list of things the captain would need . . Then, suddenly, one word. *Blast-off.*

After that a few odd-looking lines as if scrawled by a child: lines uneven, letters angular, broken. That was 12 G's.

With difficulty I make out the words. The first entry: *Everything's fine but for the cursed G-load. Vision heavily veiled* . . . Two days later:

Accelerating as calculated. Can't walk, just crawl ... A week later: *It's tough, very* (crossed out) . . . *The reactor operates as calculated.*

Then two blank pages follow, while on the third, smeared with ink, a diagonal entry: *Ground control weakening. There's some obstacle in the beam's path. This* (crossed out). *This is it.* And below, on the same page, in a firm hand: *Ground control restored. The power indicator stands at four. The captain is giving away all the power he's got but we can't stop him. This means help won't reach him in time* . . .

I close the log-book. I can only think about Zarubin now. I imagine the fading of ground control came quite unexpected. Suddenly the indicator rang and . . .

The indicator was ringing shrilly. The needle went down, quivering. The power beam had met an obstacle and control was slipping rapidly.

The captain stood at the transparent wall. The dim sun was sinking behind the horizon. Brownish shadows sped across the icy waste. The wind drove snow dust, whipped it along, carried it aloft into the murky, reddish-grey sky.

The indicator was ringing insistently. What little power was getting through was not enough for control. Zarubin was looking at the setting Barnard's Star. Behind him lamps flashed wildly on the panel of the electronic navigator.

The purplish-red disc was rapidly sinking below the horizon. For a fleeting moment a myriad of scarlet pin-points flickered on as the last rays were refracted by the ground ice. Then there was darkness.

Zarubin went over to the instrument board, switched off the indicator's signal. The needle was not moving any longer. Zarubin turned the wheel of the power regulator. The greenhouse was filled with the drone of the motors of the cooling system. He went on turning the wheel until it would turn no more. Then he went to the other side of the board, removed the safety lock and gave the wheel two more full turns. The drone rose to a shrill, vibrant, earsplitting roar.

The captain shuffled back to the wall, sank down on the bench. His hands were shaking. He took out his handkerchief and dabbed his brow. Then he pressed his cheek against the cool glass.

It was wait now, wait till the new, superpowerful signals reached the rocket and bounced back.

And he waited.

He waited, losing all awareness of time, while the microreactors roared away at bursting point and the cooling system motors shrieked and groaned. The flimsy walls shuddered.

The captain waited.

Finally something forced him up and over to the instrument board. The needle on the indicator was back to normal. There was enough power now to control the rocket. Zarubin smiled wanly, said, 'There,' and glanced at the consumption dial. The consumption was 140 times greater than the precomputed.

That night the captain did not sleep. He was compiling a new programme for the electronic navigator. All the side effects of the power failure had to be eliminated.

The wind whipped up seas of snow on the plain. A subdued aurora borealis glowed over the horizon.

The microreactors screeched as if run amok, pouring forth into space what had been carefully husbanded to last for fourteen years . . . Having fed the programme into the electronic machine the captain made a tired round of his quarters. Stars shone high above the transparent roof. Somewhere out there the *Polus* was accelerating earthwards.

It is very late but I decided to call on the director nonetheless. I remember he has mentioned some other pictures by Zarubin.

The director is sitting up.

'I knew you would come,' he says, putting on his spectacles hastily. 'Let's go, it's next door.'

In the adjacent room lit up by fluorescent lamps hang two middle-sized pictures. The first thought that crosses my mind is that the director has made a mistake. Zarubin couldn't possibly have painted these. They have nothing in common with what I saw in the morning: no colour experiments, no fantastic subjects. They are two ordinary landscapes. A road and a tree in one, and the edge of a wood in the other.

'Yes, this is Zarubin,' the director says as if reading my thoughts. 'He stayed behind on the planet - as you already know, of course. Well, it was a desperate way out, but still, it offered them a chance. I say this as an astronaut - as a former astronaut,' the director adjusted his spectacles, then went on, 'But then Zarubin did what - Well, you know about it. In four weeks he gave off the power stored for fourteen years. He restored ground control and brought the *Polus* back to her course. Well, when the rocket reached suboptical speed, braking began at normal G-load, and the crew could take over. By that time there was next to no power in Zarubin's microreactors. Nor could anything be done about it ... That was when he started on these pictures. In them his love for life and the Earth . . .'

A country road topping a rise. A mighty rugged oak tree by its side. It is done in the manner of Jules Dupre of the Barbizon school: sturdy, gnarled, full of life and vigour. The wind drives along small shaggy clouds. A boulder lies by the ditch, and it seems that only a moment ago a weary traveller has been sitting on it ... All the details are executed carefully, lovingly, with an amazingly rich colour and light shading.

The other picture was never finished. It's a wood in spring. Everything is soaked in air, light, warmth . . . Wonderful golden hues . . . Zarubin was a perfect colourist.

'I brought these pictures to the Earth,' the director says softly.

'You?'

'Yes.'

His voice is wistful, almost apologetic.

'The materials you have been looking through have no end. That is part of other expeditions. When the *Polus* returned, a rescue expedition was immediately equipped and sent out. All that could shorten the flight was done. The crew agreed to fly under 6 G's. They got to the planet - and did not find the greenhouse. They took tremendous risks and returned empty-handed. Then - many years later - I was sent. We had a breakdown on the way. There,' he put a hand up to his spectacles. 'But we got through. And found the greenhouse and the pictures . . . And a note from the captain.'

'What was in it?'

'Just one line: "Forward in face of the impossible".'

We look silently at the pictures. It suddenly occurs to me that Zarubin painted them from memory. There was ice all round him, lit up by the evil reddish glow of Barnard's Star. And on his palette he was mixing warm, sunny colours ... In item 12 he could in all truth have written: 'Am interested in, passionately love the Earth, its life, its people.'

The deserted corridors of the Archives are still and quiet. The windows are open, the sea breeze stirs the heavy curtains. The breakers roll in in stubborn cadence. They seem to whisper: forward in face of the impossible. A pause, another wave and a whisper: Forward . . . And another pause ...

I want to reply to the waves: 'Yes, forward, only forward, always forward.'

OVER THE ABYSS

by

Alexander Belayev

Alexander Belayev (1884 – 1942), a notable writer of science fiction with a hard and amazing life story. For years tuberculosis of the spine kept him confined to his bed, yet he was able to enjoy a full and interesting life. He studied law, attended the conservatoire, worked on newspapers and periodicals and was deeply interested in science and technical problems. Belayev produced a big selection of science-fiction books: The Amphibian (published by FLPH), Professor Dowell's Head, The Island of Dead Ships, The Last Man from Atlantis, A Jump into Nothingness, and others.

I. A MYSTERIOUS SUMMER HOUSE

It was during my walks just outside Simeiz, South Crimea, that the solitary summer house nestling up a steep mountainside caught my attention. No road led up to it and it was fenced off securely on all sides, its one and only gate always closed. No bush- or treetops showed over the fence and all round it there were bare yellowish cliffs with an occasional sickly juniper or tortuous pine-tree here and there.

What an idea to live on that piece of wilderness! Or does anyone? I used to wonder as I prowled round the mysterious summer house.

I never saw anybody leave the place. My curiosity thoroughly roused, I must confess I tried to steal a look inside the fenced-off grounds by climbing up the higher-standing cliffs. But the summer house was so placed that whatever cliff I climbed I could only see a corner of the yard. And it was as bare and uncultivated as were the surrounding's.

However, after a few days spent in observation I managed to catch sight of an elderly woman in black in the yard.

This only added to my curiosity. Any people living there must have some link with the outside world—if only for shopping! I thought.

I made inquiries among the people I knew and finally got wind of a rumour that Professor Wagner lived there. Professor Wagner!

That only served to rivet my attention to the summer house still more. I could give anything to see that remarkable man whose inventions had caused such a sensation. From that day I haunted the place. I had a feeling I was doing something I really ought not to do, but I went on spying on the place for hours at a stretch, in day-time and at night, from my observation post behind a juniper bush.

They say that if a man sticks to his purpose long enough he is bound to succeed in it.

Well, one morning just after dawn I suddenly heard the gate creak. I grew tense and, with bated breath, waited for developments.

The gate opened. A tall rosy-cheeked man with a fair beard and drooping moustache came out and carefully looked around. There could be no doubt, it was Professor Wagner!

Having satisfied himself that there was nobody around, he slowly climbed uphill to a piece of level ground where he started doing what looked to me a very odd exercise. Several boulders of various sizes were lying round. Wagner tried to lift each one in turn, stepping cautiously from one to another. But they were all so big and heavy that even a prize weight-lifter could hardly have moved them.

What a queer pastime, I thought. But the next moment I was so surprised that I could not contain a cry of surprise. It was something utterly unreal: Professor Wagner went up to a huge rock more than a man's height, seized it by a projecting edge and raised it with no more effort than if it had been made of cardboard. Then, stretching out his arm, he started swinging the rock around.

I just did not know what to make of it. Either Wagner possessed superhuman strength—then why couldn't he lift much smaller rocks?—or— I hadn't finished my thought when a new trick of the Professor's had me completely flabbergasted.

Wagner tossed up the rock as one would a pebble and it rose to a height of about sixty feet. Nervously I waited for the crash. But the rock fell rather slowly and I counted full ten seconds before it was a man's height off the ground again. At that moment Wagner stretched out his hand and broke the fall, his arm absolutely steady under the impact.

"Ha-ha!" Wagner laughed in a deep voice and hurled the rock away from him. First it flew parallel to the ground, then suddenly made a sheer drop and burst into pieces with a fearful crash.

"Ha-ha!" Wagner laughed again and made an extraordinary jump. Having reached a height of twelve feet or so, he was flying parallel to the ground in my direction, when, apparently owing to a miscalculation, he began to fall rapidly, just like the rock before him. Had he not fallen on sloping ground it would have been certain death for him. He fell not far from me, on the other side of the juniper bush, groaned, then swore, touching his knee. Then he made an attempt to rise and groaned again.

After some hesitation I decided to reveal my presence and render the Professor first aid.

"Are you injured? Can I help you?" I asked, stepping from behind the bush.

My appearance did not seem to surprise the Professor in the least. At any rate if it did he didn't show it.

"No, thank you," he said calmly. "I can manage." He made one more attempt to rise, but slumped back, his face contorted with pain. His knee was swelling visibly. It was plain he could not manage without help.

The situation called for prompt action.

"Let's go before pain has drained all the strength out of you," I said and helped him up. He didn't object, though every movement must have been torture. We started off slowly towards the house. I was nearly carrying him and was soon myself almost at the end of my strength under the heavy burden. Nevertheless I felt quite happy, having not only seen Professor Wagner but even made his acquaintance. Now I was looking forward to entering his house. But perhaps when we were at the gate he would thank me and leave me outside? That was what worried me as we approached the high fence. He didn't say anything, however, and we crossed the magic line.

Nor could he really. He seemed to be in great suffering, all but unconscious from pain and much jolting. I was dead tired myself. But before carrying him inside I managed to run an inquisitive eye round the yard.

It was fairly spacious, with a device looking like Maurain's apparatus standing in the middle. On the far side there was a circular hole in the ground, covered with thick glass. Around the hole, metallic arcs radiated at half-yard intervals towards the house and in several other directions.

I had no time to see any more, for the woman in black—the Professor's housekeeper, as I learned later—came running in alarm out of the house to meet us.

II. THE MAGIC CIRCLE

Wagner was in a very poor condition. His breathing was laboured and he was delirious.

Surely that miraculous mechanism, Professor Wagner's brain, hasn't been damaged by the concussion, I thought in anxiety.

In his delirium the patient recited mathematical formulae and groaned from time to time. The housekeeper was quite at a loss what to do and kept repeating:

"What's going to happen? 0 Lord, what's going to happen?"

I had to give the Professor first aid and stay there to nurse him.

It wasn't until the next morning that Wagner; came to. He opened his eyes and looked at me, fully conscious.

"Thank you..." he said in a weak voice.

I gave him a drink of water and he nodded his appreciation and asked me to leave him. Tired with the past day's anxieties and the sleepless night, I decided to leave the patient alone for a time and go outside to get some fresh morning air. The unfamiliar apparatus standing in the middle of the yard again caught my attention. I went up to it and stretched out my hand.

"Don't go near! Stop!" I heard the housekeeper's frightened voice behind me. And even as I heard it I felt my hand grow suddenly extraordinarily heavy as though it had been loaded with an enormous weight, which pulled me down with such violence that I fell flat on my face. My hand was pinned down to the ground by this invisible weight. With a supreme effort I pulled it free. It was purple and very painful.

The housekeeper stood beside me, shaking her head in dismay.

"Oh, dear, dear. How awkward of you. You'd better not go about the yard at all or you'll get flattened, God forbid."

Without understanding anything I went back indoors and applied a compress to the hand.

On his second waking the Professor looked quite refreshed. Apparently he had an exceptionally vigorous organism.

"What's that?" he asked, pointing to my hand. I explained.

"You've had a narrow escape," he said. I was burning to get an explanation from Wagner but refrained from asking questions so as not to tire him.

That evening, after his bed had been moved up to the window as he had wished, Wagner himself broached the subject in which I was so interested.

"Science studies the elemental forces," he began, "and establishes all kinds of laws, but it' knows precious little about the nature of these forces. Take electricity or gravity. We study their properties and make use of them. But the ultimate mystery of their nature they are highly reluctant to reveal. Hence we can by no means make full use of them. Electricity has proved more amenable, of course. We've harnessed it, we can say. We store it, we transmit it from place to place, we use it as and when required. But gravity is most untractable. We have to humour it, fall in with its moods instead of making it fall in with our needs. If we could regulate its power at our will, accumulate it like electricity, what a mighty implement it would make! To tame gravity has always been my fondest dream."

"And you have done it!" I exclaimed with a sudden realisation.

"Yes, I have. I discovered a technique by which we can regulate the force of gravity. You've seen my first successes. And what they cost me," Wagner said with a sigh, stroking his injured knee. "As an experiment I reduced the force of gravity in a small area near my place. You saw how easily I lifted that rock. That was done at the expense of having the force of gravity increased in a similar area inside my yard. Your curiosity nearly cost you your life when you approached my 'magic circle'.

"Look," he said, pointing to the window. "See those birds flying this way? Perhaps one of them will enter the increased-gravity zone...."

He went silent and I watched in excitement the approaching flight of the birds. Now they were above the yard....

All of a sudden one of them dropped like a stone. It was not smashed in the ordinary way, it was just smeared on the ground in a patch no thicker than cigarette-paper.

"See?" I shuddered at the thought that the same might have happened to me.

"Yes," he guessed my thought, "you'd have been crushed into a pancake by the weight of your own head." And with a smile he went on:

"Fima, my housekeeper, says my invention's a marvel for keeping stray cats away from the larder. 'Don't kill 'em,' she says, 'just make their paws stick—they won't come again.' But there are other beasts," he said after a pause, "far more harmful and dangerous, armed not with fangs and claws, but with guns and bombs.

"Just imagine what a weapon of defence harnessed gravity could make! A barrier all along state frontiers could be put up that no enemy would be able to cross. Aircraft would drop down as that bird did. What's more, even artillery shells would not be able to pass over. Or it could be done the other way round: deprive an advancing enemy of gravity, make soldiers leap aloft at their slightest move and dangle helplessly in the air.... But that's all child's play compared to what I have achieved. I have discovered a way of reducing the pull of gravity on all the surface of the earth except the poles."

"How can you do that?"

"By making the globe rotate faster—that's all," Professor Wagner said as if he were speaking of a children's top.

"What? Make the globe rotate faster?"

"Yes, and as its speed increases the centrifugal force will grow and all objects on the earth's surface will become lighter. If you don't mind staying with me for a few days—"

"I'd be delighted!"

"I'll begin the experiment as soon as I'm able to get up, and I think it will interest you."

III. "IT'S GOING ROUND"

In a few days Professor Wagner was up and about, though limping a bit. He was spending long hours in his underground laboratory in a corner of the yard, giving me the freedom of his library. He never invited me down into the lab.

One day I was sitting in the library when Wagner strode in, very excited, shouting from the doorway:

"It's going round! I've set the apparatus in motion, now we'll see what happens."

I expected something extraordinary. But hours went by, then the day was over and nothing had happened.

"You wait," the Professor said, smiling into his drooping moustache, "a centrifugal force is directly proportional to the square of the angular velocity, you know. And the earth is a sizeable top — not easy to accelerate."

As I was getting out of bed the next morning I had a feeling I was somehow lighter than usual. As a test I lifted a chair. It, too, felt much lighter. So the centrifugal force was working! I went out on the verandah and settled down to read in the shade. But soon I noticed that the shade was travelling too fast. What could that mean? Was the sun moving faster than before?

"So you have noticed?" I heard Wagner say from where he'd been watching me. "The earth is rotating faster, day and night are becoming shorter."

"But where will all this take us?" I said, confused.

"We'll live and see."

That day the sun went down earlier than usual by two hours.

"I imagine what a stir the event's produced in the whole world!" I said to the Professor. "I'd just like to know...."

"You can find out about it in my study—there's a radio set there," said Wagner.

I hurried into the study and satisfied myself that the world's population was indeed in a state of great commotion.

But that was only the beginning. The earth went on accelerating and the days grew shorter and shorter.

"All objects on the equator have lost one-fortieth of their weight by now," Wagner told me when the day and night lasted only four hours.

"Why on the equator?"

"Because the earth's pull is the weakest there while the radius of rotation longest—hence the centrifugal force is the greatest."

Scientists had already realised the danger this involved. An exodus had begun from equatorial regions to higher latitudes where the centrifugal force was smaller. So far reduced weight was proving beneficial though: locomotives could pull enormous trains, a motor-cycle engine was enough to power an air liner—at greater speeds too. People became lighter and stronger. With each day I felt more buoyant. An extraordinarily pleasant sensation!

Soon, however, the radio began reporting the first disasters. Derailments were on the increase wherever there were bends or inclines, though with little loss of life, for coaches remained intact even falling from considerable heights. The winds grew to hurricane force, raising clouds of dust which never settled. Severe floods struck the world's maritime belts.

When the angular velocity had increased seventeenfold, objects and people on the equator completely lost their weight.

That night the radio brought terrible news: there were cases in Equatorial Africa and America of people falling upwards under the pull of the centrifugal force, which kept on increasing. And soon after that more frightening news from the equator: the threat of suffocation.

"The centrifugal force is tearing the envelope of air off the globe—the earth's attraction can no longer hold it in place," the Professor explained calmly.

"But... but then we too will suffocate?" I asked in agitation.

He shrugged.

"We're well provided against any eventuality."

"But why did you start it? This is a real world catastrophe, the destruction of civilisation...."

Wagner remained unperturbed.

"You will learn later why I started it."

"Surely not just for the sake of another experiment?..."

"I don't understand your agitation," he said. "And what if it were just for an experiment? Let's not reason in a circle. When a hurricane or an erupting volcano kills people by the thousand it never enters anybody's head to blame them. Just consider this as another natural calamity."

I was not satisfied by the reply. Moreover, a feeling of ill will towards the man stirred in me for the first time.

One must be a fiend, with no touch of pity, to sacrifice the lives of millions for a scientific experiment, I thought.

My ill will towards Wagner grew at the rate I myself felt worse, and no wonder: those terrible reports about the world going to pieces, the way the days and nights flitted by at increasing speed were enough to drive one mad. I hardly slept at all and was a bundle of nerves. I had to move about taking utmost precautions. The slightest muscle contraction would shoot me head first against the ceiling, though I was little the worse for it. Things were rapidly losing weight and becoming quite unmanageable. Pieces of heavy furniture would glide away at the slightest touch.

Tap water flowed slowly, the stream visibly bending out of true. Bodily movements became convulsive; arms and legs with almost no weight to them jerked about like a string puppet's. The body's "motors"—the muscles—were much too powerful for its reduced weight. Nor could they get attuned to it, unable to keep up with the rate of change.

Fima, the housekeeper, was as exasperated as myself. Cooking became a feat of jugglery, with pots and pans flying about and herself making awkward dashes for them, jumping and dancing the while.

Wagner alone was in excellent spirits and even laughed at us.

I only ventured outside having stuffed my pockets with stones, lest I should "fall into the sky". I watched the sea growing shallower, the water being driven westwards where it was apparently flooding the coast.... On top of it all I was suffering from fits of dizziness and suffocation. The air was growing rare. The gale-force wind that had been blowing from the east seemed to be dropping. But so was the temperature of the air.

The air continued growing rarer ... the end was drawing near.... I was so miserable that I began to consider what kind of death I should choose: to fall into the sky or wait till I was suffocated.

The latter was the worse of the two but I would be able to see what would happen to the earth in the end.

No, better put an end to it all at once, I thought as a fresh fit of choking came over me, and I started unloading my pockets.

Somebody's hand stopped me.

"Wait," I heard Wagner's voice; it was barely audible in that rarefied atmosphere. "It's time we went underground."

He slipped his arm through mine, nodded to the housekeeper, who stood on the verandah, panting, and we all headed for the big round "window" in the ground. I had no will of my own and walked as if in a trance. Wagner opened the heavy door leading to the underground laboratory and pushed me in. Losing conscience, I fell softly on the stone floor.

IV. UPSIDE DOWN

I don't know how long I lay unconscious. My first sensation was that I was breathing fresh air. I opened my eyes and was very surprised to see an electric bulb fitted into the middle of the floor, not far from where I was lying.

"Don't be surprised," I heard Professor Wagner's voice. "The floor will soon turn ceiling. How do you feel?"

"Much better, thank you."

"Well, up with you then," he said, taking me by the hand. I flew up to the skylight and then sank back, very slowly.

"Come, I'll show you round my underground quarters," said Wagner.

There were three rooms altogether: two of them with artificial lighting and a third, bigger one, with a glass ceiling or floor—I'm not sure which. The trouble was that at the time we were experiencing the state of weightlessness.

This tended to make our round of the rooms quite an exhausting affair. We spun and whirled, clutching at and pushing off the furniture, leaping and hitting the tables, sometimes hanging helplessly in mid air and stretching our hands out to each other. A few inches would separate us but we would be utterly powerless to bridge them until some ingenious trick broke the balance. The things we pushed floated about with us. A chair soared in the middle of the room, glasses with water in them lay on their sides with only a little of the liquid escaping round the rim.

Then I noticed a door leading into the fourth room, out of which a whirring noise was coming.

But Wagner would not let me enter. Apparently it housed the mechanism accelerating the earth's rotation.

Soon, however, our "space flight" was over and we descended on to the glass ceiling, which was to be our floor henceforward. We didn't have to move the things because they had already moved and the electric bulb was now overhead, lighting the room throughout the short nights.

Wagner had indeed seen to everything. We were amply supplied with bottled oxygen and had plenty of canned food and water. So that's why the housekeeper did no shopping, I thought. Now that we had moved to the ceiling we found walking was quite easy, though, relatively speaking, we walked feet up. But man gets used to anything. I was taking it fairly well.

When I looked down at my feet I saw the sky beneath me through the thick translucent glass and I felt as though I were standing on a round mirror reflecting the sky above.

Sometimes it reflected unusual or fearsome things.

The housekeeper said she had to go to the house for the butter, which she had forgotten.

"But you can't," I told her. "You'll fall down— I meant to say up, dash it, it's all such a muddle now."

"I'll hold on to the brackets in the ground— the Professor's taught me how. When we were still heads up I learned 'walking on my hands' in one of the rooms where there were brackets in the ceiling."

Professor Wagner had really and truly seen to everything.

I didn't expect such bravery from a woman. To risk her life "walking on her hands" above infinite space so that we should have some butter! "All the same it's very risky," I said. "Far less than you think," Professor Wagner demurred, "Our weight is still insignificant— it just started increasing from zero, you see—and very little muscle power is required to retain our hold. Besides, I'm going with her—I've left my notebook behind."

"But there's no air outside." "We'll have compressed air helmets." And so, dressed like deep-sea divers, they started on their way. The double door shut behind them. Then I heard the bang of the outer door.

Lying on the floor, my face pressed to the thick glass, I watched their progress in alarm. Outside, two globular-helmeted figures were rapidly "walking on their hands" towards the house, clutching at the brackets in the ground, their legs in the air. It was difficult to imagine a weirder sight!

It does look fairly easy, I thought. Still, she's a remarkable woman. But what if she feels dizzy? Meanwhile Wagner and his housekeeper went up the steps in the same manner and disappeared inside the house.

Presently they were out again.

They were already halfway when something happened that sent cold shivers down my spine. The housekeeper had dropped the jar of butter and, in an effort to catch it, lost hold of the bracket and started falling into the abyss....

Wagner made an attempt to save her: he suddenly payed out a rope bound to his waist and, hooking it on to the bracket, rushed after the housekeeper. The unfortunate woman was falling rather slowly, and as Wagner had managed to accelerate his fall by a vigorous push he soon caught up with her. He was stretching out his arm for her but the centrifugal force had made her deviate a little. Again she was out of reach, the distance between the two increasing. Wagner hung on to the rope, now fully payed out, and began slowly ascending from the abyss of the sky back to the earth....

I saw the unfortunate woman wave her arms ... dwindle quickly. Then the night dropped like a curtain on this death scene....

I shuddered as I imagined what she felt.... What would become of her? Her corpse, not decomposing in the coldness of space, would go on falling for ever unless a passing planet attracted it.

I was so engrossed in my thoughts that I didn't notice Wagner had come in and sunk next to me.

"A beautiful death," he said calmly.

I clenched my teeth together, not trusting myself to speak. Hatred for the man welled up in me again.

I contemplated with horror the abyss that spread underneath me. For the first time I realised with amazing clearness that the sky was no blue expanse overhead but an abyss ... and that we live in that sky stuck to a speck, the earth, and ought really to be called skylings, not earthlings. Miserable skylings! The earth's pull had apparently a hold not only on our bodies, but on our minds as well, fettering them, making them earth-bound. Now the bond had snapped. I became aware of the transience of earthly existence. Man's mind was born together with the earth in the abyss of the sky, in the abyss of Infinite space, and there it would flicker out....

While I was thinking extraordinary things, were happening in front of me.... Stones tore away from the earth and fell upwards.... Presently whole rocks were tearing off.... Day and night were changing quicker and quicker.. .. The sun dashed across the sky-abyss and it was night, and the stars rushed past at the same frantic speed, then the sun again, then the stars again.... In a period of sunlight I saw the fence fall and reveal the horizon. I saw the dry bed of the sea and the ravaged countryside. I knew that the end of the world was at hand.....

But there were still people on the earth.... Sounds came from the loudspeaker of our radio....

The earth was laid bare almost to the very poles. There was destruction everywhere.... That was the only surviving radio station—on Wrangel Island. It was sending out its signal, waiting for a reply, but none came.... The radio waves sped through dead emptiness.... The earth was silent, the sky was silent.

Days and nights came in such quick succession that everything blurred.... The sun flying across the sky drew a fiery line against the dark background: together with the last shreds of atmosphere the earth had lost its azure canopy.... The moon was growing smaller as it drew away from an earth which was no longer able to attract it....

I felt the plate glass in the floor bulge and shudder.... Soon it would give in and I would fall into the abyss....

Who is that muttering next to me? Ah, Professor Wagner.

I raised myself with difficulty: the earth's crazy speed had made my body leaden. I was breathing heavily....

"You," I spat out. "Why did you have to do it? You have murdered mankind, you have destroyed life on earth.... You will answer for it! You will immediately reduce the earth's speed or else—"

But the Professor only shook his head.

"Speak up!" I shouted, balling my hands into fists.

"There is nothing I can do... I must have made a mistake in my calculations."

"Then you will pay for this mistake!" I shouted and, beside myself with rage, fell on Wagner and started throttling him.... At that moment I felt the floor give way, then the glass burst and I hurtled into the abyss, my hands still closed on Wagner's throat....

V. A NEW TEACHING AID

In front of me, Professor Wagner's smiling face. Bewildered, I looked at him, then around.

Early morning. The azure canopy of sky. The blue sea in the distance. Two white butterflies fluttering near the verandah added to the peace of the scene. The housekeeper went past us, a plate with a big lump of butter on it in her hand....

"What is it? What does it all mean?" I asked the Professor.

He smiled into his long moustache.

"I must apologise," he said, "for having, without your permission or even without the pleasure of meeting you before, used your person in an experiment of mine. If you know of me, as you apparently do, you are perhaps aware that for years

I've been working on the problem of how one man can cope with the immensity of modern knowledge. Personally, for instance, I've succeeded in having each half of my brain work independently. And I've done away with sleep and tiredness."

"I have read about that," I said.

Wagner nodded.

"Good. But not everybody can do that. So I decided to employ hypnosis as a teaching aid. After all, conventional teaching also involves a certain amount of hypnosis. When I went out for my walk early this morning I noticed you—behind the juniper bush. It wasn't the first time you were stationed there, eh?" he asked with a humorous flicker in his eyes.

I was confused.

"Well, I thought I'd punish you a little for your curiosity by subjecting you to hypnosis...."

"What? Was all this—"

"Just hypnosis—from the moment you saw me. But it all was real for you, wasn't it? And surely you will not forget the experience. No less than the practical lesson about the laws of gravity and centrifugal force. You proved a rather high-strung student though and by the end of the session became quite agitated...."

"But how long did it last?"

Professor Wagner glanced at his watch.

"Two minutes, not more. A fairly productive technique, don't you think?"

"But wait," I exclaimed, "what about the plate-glass window and those brackets in the ground? ..." I pointed with my hand—and was struck dumb—the yard stretched in front of us, bare of anything.

"So that, too, was ... hypnosis?"

"That's right. But frankly, you didn't find my physics lesson boring, did you? Fima," he called, "is the coffee ready? Let's go and have breakfast."

THE MAXWELL EQUATIONS

by

Anatoly Dnieprov

Anatoly Dneprov (b. 1919), the author of “The Maxwell Equations”, which he wrote in 1960, is a distinguished physicist who works at an institute of the U.S.S.R. Academy of Sciences. His favourite subject is cybernetics – its amazing achievements to date and its breath-taking potentialities. Scientific authenticity is a salient feature of his writings.

I

It all began on a Saturday evening when tired from my mathematical pursuits I took up the local evening paper and came across this advertisement on the last page:

Kraftstudt & Company Ltd.
accept orders
from organisations and individuals for all manner of calculating, analytical and computing work. High quality guaranteed. Apply:
12 Weltstrasse

That was just what I needed. For several weeks I had been sweating over Maxwell equations concerning the behaviour of electromagnetic waves in the heterogeneous medium of a special structure. In the end I had managed by a series of approximations and simplifications to reduce the equations to a form that could be handled by an electronic computer. I already pictured myself travelling up to the capital and begging the administration of the Computer Centre to do the job for me. For begging it would have to be, with the Centre working full capacity on military problems and nobody there giving a damn for a provincial physicist's dabblings in the theory of radio-wave propagation.

And here was a computer centre springing up in a small town like ours and advertising for custom in the local paper!

I took up the receiver to get in immediate touch with the company. It was only then I realised that apart from the address the advertisement gave no particulars. A computer centre not on the telephone! It just didn't make sense. I rang up the editors.

"Sorry, but that was all we received from Kraftstudt," the secretary told me. "There was no telephone in the ad."

The Kraftstudt and Co. was not in the telephone directory either.

Burning with impatience I waited for the Monday. Whenever I looked up from those neatly penned equations concealing complicated physical processes, my thoughts would turn to Kraftstudt Co. Men of vision, I thought. In our time and age when mankind endeavours to clothe its every idea in mathematical garbs, it would be hard to imagine a more profitable occupation.

Incidentally, who was this Kraftstudt? I had been resident in the town quite a long time but the name rang no bell. As a matter of fact, I did vaguely recollect having heard the name before. But I couldn't remember when or where, no matter how hard I jogged my memory.

Came the Monday. Pocketing the sheet of equations, I started out in search of 12 Weltstrasse. A fine drizzle forced me to take a taxi.

"It's a goodish way off," said the cabby, "beyond the river, next door to the lunatic asylum."

I nodded and off we went.

It took us about forty minutes. We passed through the town gates, went over a bridge, skirted a lake and found ourselves in the country. Early green shoots could be seen here and there in the fields along the unmetalled road, and the car stalled between banks of mud every now and then, its back wheels skidding furiously.

Then roofs appeared, then the red brick walls of the lunatic asylum standing in a little depression and jocularly referred to in town as the Wise Men's Home.

Along the tall brick wall bristling with bits of broken glass ran a clinker lane. After a few turnings the taxi pulled up at an inconspicuous door.

"This is Number Twelve."

I was unpleasantly surprised to find that Kraftstudt Co.'s premises were in the same building as the Wise Men's Home. Surely Herr Kraftstudt hasn't ganged up the loonies to do "all manner of mathematical work" for him, I thought—and smiled.

I pressed the doorbell. I had to wait long, the better part of five minutes. Then the door opened and a pale-faced man with thick tousled hair appeared and blinked in the daylight.

"Yes, sir?" he asked.

"Is this Kraftstudt's mathematical company?" I asked.

"Yes."

"And you advertised in the newspaper?..."

"Yes."

"I have some work for you."

"Please come in."

Telling the driver to wait for me, I bent my head and slipped through the door. It closed and I was plunged in complete darkness.

"Follow me, please. Mind the steps. Now to your left. More steps. Now we go up...."

Holding me by the arm and talking thus, the man dragged me along dark crooked corridors, up and down flights of stairs.

Then a dim yellowish light gleamed overhead, we climbed a steep stone staircase and emerged into a small hall.

The young man hurried behind a partition, pulled up a window open and said:

"I'm at your service."

I had a feeling of having come to the wrong place. The semi-darkness, the underground labyrinth, this windowless hall lighted by a single naked bulb high at the ceiling, all added up to a thoroughly odd impression.

I looked around in confusion.

"I'm at your service," the young man repeated, leaning out of the window.

"Why, yes. So this is the Kraftstudt and Co. computer centre?"

"Yes, it is," he cut in with a trace of impatience, "I told you that before. What is your problem?"

I produced the sheet of equations from my pocket and handed it through the window.

"This is a linear approximation of those equations in their partial derivatives," I began to explain, a little uncertainly. "I want them solved at least numerically, say, right on the border line between two media.... This is a dispersion equation, you see, and the velocity of radio-wave propagation here changes from point to point."

Snatching the sheet from my hand the young man said brusquely:

"It's all clear. When do you want the solution?"

"What do you mean—when?" I said, surprised. "You must tell me when you can do it."

"Will tomorrow suit you?" he asked, his deep dark eyes now full on me.

"Tomorrow?"

"Yes. About noon...."

"Good Lord! What a computer you've got! Fantastic speed!"

"Tomorrow at twelve you will have your solution, then. The charge will be four hundred marks. Cash."

Without saying another word I handed him the money together with my visiting-card.

On our way back to the entrance the young man asked:

"So you are Professor Rauch?"

"Yes. Why?"

"Well, we always thought you'd come to us sooner or later."

"What made you think so?"

"Who else could place orders with us in this hole?"

His answer sounded fairly convincing.

I barely had time to say good-bye to him before the door was shut on me.

All the way home I thought about that strange computer centre next door to a madhouse. Where and when had I heard the name of Kraftstudt?

2

The next day I waited for the noon mail with mounting impatience. When the bell rang at half past eleven I jumped up and ran to meet the postman. To my surprise I faced a slim pale girl holding an enormous blue envelope in her hand.

"Are you Professor Rauch, please?" she asked.

"Yes."

"Here's a package for you from Kraftstudt's. Please sign here."

There was only one name—mine—on the first page of the ledger that she held out for me. I signed and offered her a coin.

"Oh, no!" She flushed, murmured good-bye and was gone.

When I glanced at the photo copies of a closely-written manuscript I couldn't believe my own eyes. From an electronic computer I had expected something entirely different: long columns of characters with the values of the argument in the first column and those of the solution in the second.

But what I held in my hand was a strict and precise solution of my equations!

I ran my eye through page after page of calculations that took my breath away with their originality and sheer beauty. Whoever had done it possessed an immense mathematical knowledge to be envied by the world's foremost mathematicians. Almost all the modern armoury of mathematics had been employed: the theory of linear and non-linear differential and integral equations, the theory of the functions of a complex alternating current, and those of groups, and of plurality, and even such apparently irrelevant systems as topology, number theory and mathematical logic.

I nearly cried out in delight when at the end of a synthesis of countless theorems, intermediate calculations, formulae and equations the final solution emerged—a mathematical formula taking up three whole lines.

And to add a touch of the exquisite, the unknown mathematician had given himself the trouble of resolving the long formula into a simpler one. He had found a brief and precise form containing only the more elementary algebraic and trigonometric expressions.

At the very end, on a small inset, there was a graphic representation of the solution.

I could wish for nothing better. An equation which I thought could not be solved in the final form had been solved.

When I had recovered a little from my initial surprise and admiration I went through the photo copies again. Now I noticed that he who had solved my problem had been writing in great hurry and very closely as though trying to save on every scrap of paper and every second of time. Altogether he had written twenty-eight pages and I pictured mentally what a titanic work that had been! Try and pen a letter of twenty-eight closely-written pages in one day or just copy, without following the meaning, twenty-eight pages out of a book, and you will surely find it a hellish job.

But what I had in front of me was not a letter to a friend or a chapter copied out of a book. It was the solution of a most intricate mathematical problem—done in twenty-four hours.

For several hours I studied the closely-written pages, my surprise mounting with each hour.

Where had Kraftstudt found such a mathematician? On what terms? Who was he? A man of genius nobody knew? Or perhaps one of those wonders of human nature that sometimes occur on the border line between the normal and the abnormal? A rare specimen Kraftstudt had unearthed in the Wise Men's Home?

Cases have been recorded of brilliant mathematicians ending their days in a lunatic asylum. Maybe my mathematician was one of those?

These questions plagued me for the rest of that day.

But one thing was clear: the problem had been solved not by a machine, but by a man, a mathematical wizard the world knew nothing about.

The next day, a little calmer, I re-read the whole solution for the sheer pleasure of it this time, just as one will listen again and again to a piece of music one loves. It was so precise, so limpid, so beautiful that I decided to repeat the experiment. I decided to give Kraftstudt Co. one more problem to solve.

That was easy, for I was never short of challenging problems, and I chose an equation which I had always thought impossible to break down so that it could be handled by a computer, let alone be finally solved.

This equation, too, dealt with radio-wave propagation, but it was a specific and very complex case. It was an equation of the type that theoretical physicists evolve for the fun of it and soon forget all about because they are much too complex and therefore of no use to anybody.

I was met by the same young man blinking in the daylight. He gave me a reluctant smile.

"I have another problem—" I began.

Nodding briefly he again led me all the way through the dark corridors to the bleak reception hall.

Knowing the drill now, I went up to the window and handed him my equation.

"So it's not computers that do these things here?"

"As you see," he said without looking up from my equation.

"Whoever solved my first problem is quite a gifted mathematician," I said.

The young man did not say a word, deep as he was in my equation.

"Is he the only one in your employ or have you several?" I asked.

"What has that to do with your requirements? The firm guarantees—"

He had no time to finish, for at that moment the deep silence of the place was shattered by an inhuman scream. I started and listened. The sound was coming from behind the wall beyond the partition. It was like somebody being tortured. Crumpling the sheets with my problem, the young man, throwing a side glance and seizing me by the hand, dragged me to the exit.

"What was that?" I asked, panting.

"You'll have the solution the day after tomorrow, at twelve. You'll pay the bearer."

With those words he left me by my taxi.

3

It is hardly necessary to say that after this event my peace of mind was completely gone. Not for one moment could I forget that terrible scream which had seemed to shake the very stone vaults sheltering Kraftstudt and Co. Besides I was still under the shock of finding such a complicated problem solved by one man in one day. And finally I was feverishly waiting for the solution of my second problem. If this one too was solved, then....

It was with shaking hands that two days later I received a package from the Kraftstudt's girl. By its bulk I could tell that it must contain the solution to the monstrously complicated piece of mathematics. With something akin to awe I stared at the thin creature in front of me. Then I had an idea.

"Please come in, I'll get the money for you."

"No, it's all right." She seemed frightened and in a hurry. "I'll wait outside...."

"Come on in, no point in freezing outside," I said and all but dragged her into the hall. "I must have a look first to see whether the work's worth paying for."

The girl backed against the door and watched me with wide-open eyes.

"It is forbidden..." she whispered.

"What is?"

"To enter clients' flats.... Those are the instructions, sir...."

"Never mind the instructions. I'm the master of this house and nobody will ever know you've entered."

"Oh, sir, but they will, and then...."

"What then?" I said, coming nearer.

"Oh. it's so horrible...."

Her head drooped suddenly and she sobbed.

I put a hand on her shoulder but she recoiled.

"Give me the seven hundred marks at once and I will go."

I held out the money, she snatched it and was gone.

Opening the package I nearly cried out with astonishment. For several minutes I stood there staring at the sheaf of photo paper unable to believe my own eyes. The calculations were done in a *different* hand.

Another mathematical genius! And of greater calibre than the first. The equations he had solved in an analytical form on fifty-three pages were incomparably more complicated than the ones I had handed in die first time. As I peered at the integrals, sums, variations and other symbols of the highest realms of mathematics I had a sudden feeling of having been transferred into a strange mathematical world where difficulty had no meaning. It just didn't exist.

That mathematician, it seemed, had no more difficulty in solving my problem than we have in adding or subtracting two-digit numbers.

Several times I tore myself away from the manuscript to look up a thing in a mathematical manual or reference book. I was amazed by his skill in using the most complex theorems and proofs. His mathematical logic and methods were irreproachable. I did not doubt that had the best mathematicians of all nations and ages, such as Newton, Leibnitz, Gauss, Euler, Lobachevsky, Weierstrass and Hilbert, seen the way my problem had been solved they would have been no less surprised.

When I finished reading the manuscript I fell to thinking.

Where did Kraftstudt get these mathematicians? I was convinced now he had a whole team of them, not just two or three. Surely he couldn't have founded a computer firm employing only two or three men. How had he managed it? Why was his firm next door to a lunatic asylum? Who had uttered that inhuman scream behind the wall? And why?

"Kraftstudt, Kraftstudt..." hammered in my brain. Where and when had I heard that name? What was behind it? I paced up and down my study, pressing my head with my hands, tasking my memory.

Then I again sat down to that genius-inspired manuscript, delighting in it, re-reading it part by part, losing myself to the world in the complexities of intermediate theorems and formulae. Suddenly I jumped up because I recalled that terrible inhuman scream once more and with it came the name of Kraftstudt.

The association was not fortuitous. No, it was inevitable. The screams of a man tortured and—Kraftstudt! These naturally went together. During the Second World War a Kraftstudt served as investigator in a Nazi concentration camp at Graz. For his part in the murders and inhuman treatment he got a life sentence at the Nuremberg trials.

I remembered the man's photo in all newspapers, in the uniform of an SS Obersturmfuhrer, in a pince-nez, with wide-open, surprised eyes in a plump good-natured face. People wouldn't believe a man with such a face could have been a sadist. Yet detailed evidence and thorough investigation left no room for doubt.

What had happened to him since the trials? Maybe he had been released like many other war criminals?

But what had mathematics to do with it all? What was the connection between a sadistic interrogator and the solutions of differential and integral equations?

At this point the chain of my reasoning snapped, for I was powerless to connect those two links. Obviously there was a link missing somewhere. Some kind of mystery.

Hard as I beat my brains, however, I could think of nothing plausible. And then that girl who said, "They will know." How scared she was!

After a few days of tormenting guess-work. I finally realised that unless I cracked the mystery I would probably crack up myself.

First of all I wanted to make sure that the Kraftstudt in question was that same war criminal.

4

Finding myself at the low door of Kraftstudt and Co. for the third time, I felt that what was to happen next would influence my whole life. For no reason I could understand then or later, I paid off the taxi and rang the bell only after the cab swung round the corner.

It seemed to me that the young man with his crumpled old-mannish face had been waiting for me. Without saying a word he took me by the hand and led me through the dark subterranean maze into the reception hall where I had been on the two previous occasions.

"Well, what brings you here this time?" he asked in what seemed to me a mocking tone of voice.

"I wish to speak to Herr Kraftstudt personally," I demanded.

"Our firm is not satisfying you in some way, Professor?" he asked.

"I wish to speak to Herr Kraftstudt," I insisted, trying not to look into his prominent black eyes, which now shone with malicious mockery.

"As you wish. It's none of my business," he said after a long scrutiny. "Wait here."

Then he disappeared through one of the doors behind the glass partition.

He was gone over half an hour arid I was dozing off when a rustle came to me from a corner and out of the semi-darkness stepped a white-smocked figure with a stethoscope in hand. "A doctor," flashed through my mind. "Come to examine me. Is this really necessary to see Herr Kraftstudt?"

"Follow me," the doctor said peremptorily and I followed him, having no idea what was to happen next and why I had ever started it.

Light filtered into the long corridor in which we now were through a skylight high up somewhere. The corridor ended with a tall massive door. The doctor stopped.

"Wait here. Herr Kraftstudt will see you presently."

In about five minutes he opened the door wide for me.

"Well, let's go," he said in the tone of a man who was regretting what was going to happen.

I obediently followed him. We entered a wing with large bright windows and I shut my eyes involuntarily.

I was brought out of my momentary stupor by a sharp voice:

"Why don't you come up, Professor Rauch?"

I turned to my right and saw Kraftstudt in a deep wicker-work chair, the very man whom I remembered so well from the newspaper pictures.

"You wished to see me?" he asked, without greeting me or rising from his desk. "What can I do for you?"

I controlled myself with an effort and went right up to his desk.

"So you have changed your occupation?" I asked, looking hard at him. He had aged in those fifteen years and the skin on his face had gathered into large flabby folds.

"What do you mean, Professor?" he asked, looking me over carefully.

"I had thought, Herr Kraftstudt, or rather hoped that you were still...."

"Ah, I see." And he guffawed.

"Times have changed, Rauch. Incidentally, it's not so much your hopes I am interested in at present, as the reasons that brought you here."

"As you can probably guess, Herr Kraftstudt, I have a fair knowledge of mathematics, I mean modern mathematics. I thought at first you had organised an ordinary computer centre equipped with electronic machinery. However I'm now convinced that this is not the case. In your establishment it's men who solve the problems. As only men of genius would solve them. And what is most strange—with monstrous, inhuman speed. If you like, I presumed to come and meet your mathematicians, who are indeed extraordinary men."

Kraftstudt first smiled, then began to laugh quietly, then louder and louder.

"I don't see the joke, Herr Kraftstudt," I said indignantly. "My wish appears ridiculous to you, does it? But don't you realise that anybody with an interest in mathematics would have the same wish on seeing the kind of solution I got from your firm?"

"I'm laughing at something quite different, Rauch. I'm laughing at your provincial narrow-mindedness. I'm laughing at you, Professor, a man respected in the town, whose learnedness has always boggled the imagination of immature maidens and old spinsters, at the way you hopelessly lag behind the swift strides of modern science!"

I was staggered by the insolence of that ex-Nazi interrogator.

"Listen, you," I shouted. "Only fifteen years ago your speciality was applying hot irons to innocent people. What right have you to prattle about swift strides of science? Come to that, I wished to see you to find what methods you use to force the brilliant people in your power to perform work which would take men of genius several years or perhaps all their life to do. I'm very glad I have found you. I consider it my duty as a scientist and citizen to let all the people in our town know that a former Nazi hangman has chosen as his new trade to abase men of science, men whose duty has always been to work for the good of humanity."

Kraftstudt got up from his chair and, frowning, approached me.

"Listen to me, Rauch. Take my advice and do not provoke me. I knew you would come to me sooner or later. But I never imagined you would be such an idiot. Frankly speaking, I thought I would find in you an ally, so to speak, and a helper."

"What?" I exclaimed- "First you explain to me by what honest or dishonest means you are exploiting the people who bring you profit."

Before my very eyes his face shrunk into a lump of dirty-yellowish skin. The pale-blue eyes behind the pince-nez turned into two slits that bore into me acidly. For a fleeting moment I had a feeling of a thing being examined by a prospective buyer.

"So you want me to explain to you how honestly our firm operates? So you're not satisfied with having your idiotic sums done for you as they should be done in the twentieth century? You want to experience for yourself what it means to be solving such problems?" he hissed, his vile face a mask pulsating with rage and hate.

"I don't believe all is above-board here. Your reputation is proof enough. And then I overheard one of your men screaming—"

"That's enough," Kraftstudt barked. "After all I never asked you to come. But since you are here — and in such a mood—we'll make use of you whether you like it or not."

I had been unaware that the doctor who had brought me there was standing all the time behind me. At a signal from Kraftstudt a muscular hand closed on my mouth, and a piece of cotton soaked in something pungent was thrust under my nose. I lost consciousness.

5

I came to slowly and realised that I was lying stretched on a bed. Voices of men in a heated argument crowded in on me. For a while all I knew was that their subject was scientific. Then, as my head cleared a little, I could understand what it was about.

"I can tell you this: your Nichols is no example. The coding of stimulation is highly individual, you know. What stimulates will-power in one man might stimulate something quite different in another. For instance, an electric impulse that gives Nichols pleasure deafens me. When I get k I've a feeling two tubes have been thrust into my ears with a couple of aircraft engines revving up at the other end."

"All the same the activity rhythm of neurone groups in the brain doesn't differ much from man to man. That's what our teacher's 'taking advantage of really."

"With not much success though," a tired voice said. "Nothing beyond mathematical analysis so far."

"It's all a matter of time. No short cuts here. Nobody would introduce an electrode into your brain to examine the impulses, because that would damage the brain and consequently the impulses. Now a generator allows for a wide range of change in coded impulses. And that makes for experiments without damage .to the brain."

"That's as may be," the tired voice demurred. "The cases of Gorin and Void don't bear you out. The former died within ten seconds of being put inside a frequency-modulated field. The latter screamed with pain, so the generator had to be switched off immediately. You seem to forget the principal thing about neurocybernetics, friends, and that is that the network of neurones in the human body effects immense numbers of synapses. The impulses these transmit have their own frequency. As soon as you are in resonance with this natural frequency your circuit gets tremendously excited. The doctor's probing blindfolded, so to speak. And that we are still alive is pure chance."

At that moment I opened my eyes. I was lying in a room that looked like a large hospital ward with beds lining the walls. In the middle stood a big deal table piled high with remnants of food, empty tins, cigarette stubs and scraps of paper. The scene was lit dimly by electric light. I rose on my elbows and looked round. Immediately the conversation stopped.

"Where am I?" I whispered, looking over the faces staring at me.

A voice whispered, "The new chap's come to."

"Where am I?" I repeated, addressing them all.

"So you don't know?" asked a young man in his underwear, sitting upright in the bed to my right.

"This is the firm of Kraftstudt, our creator and teacher."

"Creator and teacher?" I mumbled, rubbing my leaden forehead. "What do you mean—teacher? He's a war criminal."

"Crime is relative. It all depends on the purpose. If the end is noble, any action is good," trotted out my neighbour on the right.

This piece of vulgar Machiavellianism made me look at the man with renewed curiosity.

"Where did you pick up that bit of wisdom, young man?" I said, letting my feet down and facing him.

"Herr Kraftstudt is our creator and teacher," they suddenly began to chant in chorus.

So I have landed in the Wise Men's Home after all, I thought.

"Well, friends, things must be very bad for you to say a thing like that," I said, looking them over again.

"I bet the new boy has his maths in a frequency band between ninety and ninety-five cycles!" a stout fellow shouted, half-rising from his bed.

"And he'll squeal with pain at no more than 140 cycles in the uniformly accelerated pulse code!" bellowed another.

"And he'll be forced to sleep by receiving a series of eight pulses per second with a pause of two seconds after each series!"

"I am certain the new boy will develop ravenous hunger if stimulated at a frequency of 103 cycles with a logarithmic increase in the pulse power."

The worst I could imagine had happened. I was indeed among madmen. The strange thing, however, was that they all seemed to have the same obsession: the possible influence of some kind of codes and pulses on my sensations. They thronged round me goggle-eyed, shouting out figures, giving modulations and powers, betting on how I would act "inside the generator" and "between the walls" and what power I was likely to consume.

Knowing from books that madmen should not be contradicted, I decided not to start any arguments but to try and behave like one of them. So I spoke in as inoffensive a tone as possible to my neighbour on the right. He seemed just a bit more normal than the others.

"Would you please tell me what you're all talking about? I must admit I'm completely ignorant of the subject. All these codes, pulses, neurones, stimulations—"

The room shook to a burst of guffaw. The inmates reeled with laughter, holding their sides, rocking and doubling up. The laughter became hysterical when I rose in indignation to shout them down.

"Circuit Number Fourteen. Frequency eighty-five cycles! Stimulation of anger!" somebody shouted and their laughter crescendoed.

Then I sat on the bed and resolved to wait till they calmed down.

My neighbour on the right was the first to do so. Then he sat on my bed and fixed his eyes on mine.

"Do you mean to say you really don't know anything?"

"Word of honour, not a thing. I can't make head or tail of what you were saying."

"Word of honour?"

"Word of honour."

"All right. We'll believe you, though you're certainly a rare case. Deinis, get up and tell the new boy what we're here for."

"Yes, Deinis, get up and tell him all about it. Let him be as happy as we are."

"Happy?" I asked, surprised. "Are you happy?"

"Of course we are, of course we are," .they all shouted. "Why, we know ourselves now. Man's highest bliss is to know himself."

"Didn't you know yourselves before?" I asked.

"Of course not. People don't know themselves. Only those who are familiar with neurocybernetics know themselves."

"Long live our teacher!" someone shouted.

"Long live our teacher!" they all shouted in automatic unison.

The man whom they called Deinis came up and sat down on the bed next to mine.

"What education have you?" he asked in a hollow tired voice.

"I am a professor of physics."

"Do you know anything about neuropsychology?"

"Nothing at all."

"Cybernetics?"

"Almost nothing."

"Neurocybernetics and the general theory of biologic regulation?"

"Not the vaguest idea."

An exclamation of surprise sounded in the room. "Not a chance," Deinis muttered. "He won't understand."

"Go on, please, I'll try my best to follow you." "He'll understand all right after a dozen generator sessions or so," a voice said.

"I understood after five!" someone shouted. "A couple of turns between the walls will be even better."

"Anyway, explain things to me, Deinis," I insisted, fighting down a terrible premonition. "Well, do you understand what life is?" For a long time I said nothing, staring at Deinis. "Life is a complex natural phenomenon," I uttered at last.

There was a snigger. Then another. Then many more. The inmates of the ward were looking at me as though I had just uttered some obscene nonsense. Deinis shook his head disapprovingly.

"You're in a bad way. You've a lot to learn," he said.

"Tell me where I am wrong."

"Go on, Deinis, explain to him," they all shouted in unison.

"Very well. Listen. Life is constant circulation of coded electrochemical stimulations along the neurones of your organism."

I thought that over. Circulation of stimulations along neurones. I seemed to remember hearing something like that before.

"Well, carry on."

"All the sensations that go to make up your spiritual ego are nothing but electrochemical impulses that travel from receptors up to the brain to be processed, and then down to effectors."

"Yes, well?"

"All sensations of the outer world pass along the nerve fibres to the brain. Each sensation has its own code, frequency and speed. And these three parameters determine its quality, intensity and duration. Understand that?"

"Let's assume I do."

"Hence life is nothing more nor less than the passage of coded information along your nerve fibres. And thought is the circulation of frequency-modulated information through the neurone synapses in the central regions of the nervous system, that is, in the brain."

"I don't quite understand that," I confessed.

"It's like this. The brain is made up of close on ten thousand million neurones similar to electric relays. They are linked up into an elaborately interconnected system by fibres called axones. These conduct stimulation from neurone to neurone. It is this wandering of stimulation along the neurones that we call thought."

My premonition grew to fear.

"He won't understand a thing until he's been inside the generator or between the walls," shouted several voices at once.

"Well, let's assume you're right. What follows from that?" I said to Deinis.

"That life can be shaped at will. By means of pulse generators stimulating the corresponding codes in the neurone synapses. And that is of enormous practical importance."

"Meaning?" I asked softly, sensing that I was about to get an insight into Kraftstudt and Co.'s activities.

"That can be best explained by an example. Let us consider the stimulation of mathematical activity. Certain backward countries are at present building what are called electronic computers. The number of triggers, or relays, such machines have does not exceed five to ten thousand. The number of triggers in the mathematical areas of the human brain is in the order of one thousand million. Nobody will ever be able to build a machine with anywhere near that number."

"Well, what of it?"

"Here you are: mathematical problems can be solved much more efficiently and cheaply by a mechanism created by Mother Nature and lodged here," Deinis passed his hand across his forehead, "than by any expensive junk built for the job."

"But machines work quicker!" I exclaimed. "A neurone, as far as I remember, can be excited no more than 200 times per second, whereas an electronic trigger can take millions of pulses. That is precisely why fast-working machines are more efficient!"

The ward rocked with laughter again. Deinis alone retained his poker face.

"You're wrong there. Neurones can be made to take impulses at any speed provided the exciter has a sufficiently high frequency. For example, an electrostatic generator operating in the pulsed condition. If you place a brain in the radiation field of such a generator it can be made to work to any speed."

"So that is 'the way Kraftstudt and Co. make their money, is it!" I said, jumping up from the bed.

"He is our teacher!" they all chanted again. "Repeat it, new boy. He is our teacher!"

"Leave him," Deinis ordered suddenly. "He will understand in time that Herr Kraftstudt is our teacher. He doesn't know anything yet. Listen to this, new boy.

Every sensation has its own code, its intensity and duration. The sensation of happiness—55 cycles per second with coded series of one hundred pulses each. The sensation of grief—62 cycles with a pause of 0.1 second between pulses. The sensation of joy—47 cycles with pulses increasing in intensity. The sensation of sadness—203 cycles, pain—123 cycles, love—14 cycles, poetic mood—31, anger—85, fatigue—17, sleepiness—eight, and so on. Coded pulses in these frequencies move along the neurones and thus you experience all the sensations I've mentioned. They can all be produced by a pulse generator created by our teacher. He has opened our eyes to the meaning of life."

These explanations made me giddy. I didn't know what to think. The man was either as mad as a hatter or really giving me a glimpse into mankind's future. I was still dizzy from the after-effects of the drug I'd been given in Kraftstudt's study. A wave of weariness swept over me, I lay back and closed my eyes.

"He's under frequency seven to eight cycles! He wants to sleep!" someone shouted.

"Let him have his sleep. Tomorrow he'll start learning life. They'll take him inside the generator tomorrow."

"No, he'll have his spectre recorded tomorrow. He might have abnormalities."

That was the last thing I heard. I slid into deep sleep.

The man I met the next day at first appeared to me quite pleasant and intelligent. When I was led into his study up a floor in the firm's main building he came forward to meet me, smiling broadly, hand stretched out in greeting.

"Ah, Professor Rauch. I'm indeed pleased to meet you."

Returning his greeting with restraint I inquired after his name.

"My name is Boltz, Hans Boltz. Our chief has given me an embarrassing commission—that of extending apologies to you in his name."

"Apologies? Is your chief really subject to pangs of conscience?"

"I don't know. I'm sure I don't know, Rauch. Anyway, he's extending his most sincere apologies to you for all that has happened. He lost his temper. He doesn't like being reminded of the past, you know."

I smiled wryly.

"Why, I did not come with any intention of raking in his past. My interest lay elsewhere. I wanted to meet those who so brilliantly solved—"

"Pray, be seated, Professor. That is exactly what I was going to speak to you about."

I settled in the proffered chair and studied the broadly smiling face behind the large desk. Boltz was a typical north-country German with an elongated face, fair hair and large blue eyes. His fingers were playing with a cigarette-case.

"I'm in charge of the maths department here," he said.

"You? Are you a mathematician?"

"Yes, in a way. At least I have a smattering of it."

"That means I can meet some of them through you?"

"You've already met all of them, Rauch," Boltz said.

I stared at him blank-eyed.

"You've spent a day and night with them."

I remembered the ward and its inmates with their nonsense about impulses and codes.

"Do you expect me to believe those crackpots are the brilliant mathematicians who solved my equations?"

Not waiting for a reply I broke into laughter.

"And yet they are, indeed. Your last problem was solved by a certain Deinis. As far as I know the same individual who last night gave you a lecture on neurocybernetics."

After a few moments' thought I said:

"In that case I don't understand anything. Perhaps you would explain it all to me?"

"With pleasure. Only after you've seen this." And Boltz offered me the morning paper.

I unfolded it slowly and suddenly jumped up. Looking at me from the first page was ... my own face framed in black. Over it was the banner caption: "Tragic death of Dr. Rauoh."

"What's the meaning of this, Boltz? What sort of farce is this?" I expostulated.

"Please calm yourself. It's all quite sample really. Last night when crossing the bridge over the river on your way home from a walk near the lake, you were attacked by two escaped lunatics from the Wise Men's Home, killed, mutilated and thrown into the river. Early this morning a corpse was discovered at the dam. The clothes, personal belongings and papers helped to identify the corpse as yours. The police called at the Home this morning and have pieced together a complete picture of your tragic death."

It was only then I looked at my clothes and realised that the suit I had on was not mine; I dived into my pockets, all the things I'd had on me were gone.

"But this is preposterous—"

"Yes, of course, I quite agree. But what can be done, Rauch, what can be done? Without you Kraftstudt and Co. may suffer a serious setback —go bust, if you like. I don't mind telling you that we are up to our eyebrows in orders. They're all military and extremely valuable. And that means round-the-clock computing. Since we completed the first batch of problems for the Defence Ministry business has just snowballed, you could say."

"And you want me to become another Deinis for you?"

"Oh, no, Rauch. Of course not."

"Then why that farce?"

"We need you as instructor in mathematics."

"Instructor?" I jumped up again, staring wildly at Boltz. He lighted a cigarette for himself and nodded at my chair. I sat down, completely bewildered.

"We need new mathematicians, Professor Rauch. Either we get them or we'll very soon be on the rocks."

I stared at the man who did not seem to me half as pleasant now as he'd done before. I seemed to discern traits of innate bestiality in him, faint, but coming to the fore now.

"Well, what if I refuse?" I asked. "That would be just too bad. I'm afraid you'd have to join our—er—computer force then." "Is that so bad?" I asked.

"It is," Boltz said firmly, standing up. "That would mean you'd finish your days in the Wise Men's Home."

Pacing up and down the room, Boltz began to speak in the tones of a lecturer addressing an audience:

"The computing abilities of the human brain are several hundred thousand times those of an electronic computer. A thousand million mathematical nerve cells plus the aids—memory, inhibition, logic, intuition, etc.—place the brain high above any conceivable machine. Yet the machine has one essential advantage."

"Which?" I asked, still not understanding what Boltz was driving at.

"If, say, a trigger or a group of triggers is out of order in an electronic machine, you can replace the valves, resistors or capacitors and the machine will work again. But if a nerve cell or a group of nerve cells in the computing area is out of order, replacement, alas, is impossible. Unfortunately we are obliged to make brain triggers work at an increased tempo here. As a result, wear and tear, if I may call it so, is greatly accelerated. The living computers are soon used up arid then—"

"What then?"

"Then the computer gets into the Home."

"But that's inhuman—and criminal," I said hotly.

Boltz stopped in front of me, placed a hand on my shoulder and, with a broad smile, said:

"Rauch, you've got to forget all those words and notions here. If you won't forget them yourself we'll have to erase them from your memory for you."

"You will never be able to do that!" I shouted, brushing away his hand.

"Deinis's lecture was wasted on you, I see. Pity. He spoke sense. Incidentally, d'you know what memory is?"

"What has that to do with our subject? Why the hell are you all buffooning here? Why—?"

"Memory, Professor Rauch, is prolonged stimulation in a group of neurones due to a positive reverse connection. In other words, memory is the electrochemical stimulation that circulates in a given group of nerve cells in your head. You, as a physicist interested in electromagnetic processes in complex media, must realise that by placing your head in the appropriate electromagnetic field we can stop that circulation in any group of neurones. Nothing could be simpler! We can not only make you forget what you know, but make you recall what you have never known. However it's not in our interests to resort to these—er— artificial means. We hope your common sense will prevail. The firm will be making over to you a sizeable share of its dividends."

"For what services?"

"I've already told you—for teaching mathematics. We sign up classes of twenty to thirty people with an aptitude for maths—this country has an abundance of unemployed, fortunately. Then we teach them higher mathematics in the course of two to three months—"

"But that's impossible," I said, "absolutely impossible. In such a short time, I mean...."

"It's *not* impossible, Rauch. Don't forget you'll be dealing with a very bright audience, uncommonly intelligent and possessing a wonderful memory for figures. We will see to that. That is in our power."

"Also by artificial means? By means of the pulse generator?" I asked.

Boltz nodded.

'Well, do you agree?"

I shut my eyes tightly and thought hard. So Deinis and the others in the ward were normal people and had been telling me the truth yesterday. So Kraftstudt and Go. had really developed a technique of commercialising human thought, will-power and emotions by means of electromagnetic fields. I sensed Boltz's searching glance on me and knew I must hurry with my decision. It was devilishly hard to make. If I agreed I'd be speeding my students on their way to the Wise Men's Home. If I refused I'd do the same to myself.

"Do you agree?" Boltz repeated, touching me on the shoulder.

"No," I said, my mind made up. "No. I can be no accomplice to such abomination."

"As you wish," he said with a sigh. "I'm very sorry, though."

After a minute's silence he stood up briskly, went over to the door and, opening it, called out:

"Eider, Schrank, come in here!"

"What are you going to do to me?" I asked, also getting up.

"To begin with we'll record the pulse-code spectre of your nervous system."

"Which means?"

"Which means we'll record the form, intensity and frequency of the pulses responsible for your every emotional and intellectual state and make them into a chart."

"But I won't let you. I will protest. I—"

"Show the Professor the way to the test laboratory," Boltz cut in indifferently and turned his back on me to look out of the window.

As I entered the test laboratory I had already formed the decision which was to play a crucial role in the events that followed. My line of reasoning was this. They are going to subject me to a test that will give Kraftstudt and his gang complete information on my inner self. They need this to know what electromagnetic influence to bring to bear on my nervous system to produce any emotion or sensation they want. If they are fully successful I'll be in their power beyond hope of escape. If they are not I'll retain a certain amount of free play. Which I might soon badly need. So the only hope for me is to try to fool those gangsters as much as possible. That I can' do so to a degree I deduced from what a slave of Kraftstudt's said yesterday about pulse-code characteristics being individual, except where mathematical thought is concerned.

I was led into a large room cluttered up with bulky instrumentation, the whole looking like the control room of a power station. The middle of the laboratory was taken up by a control console with instrument panels and dials. To its left, behind a screen of wire mesh, towered a transformer, several generator lamps glowing red in white porcelain panels. Fixed to the wire mesh which served as a screen-grid for the generator were a voltmeter and an ammeter. Their readings were used, apparently, to measure the generator's output. Close by the control console stood a cylindrical booth made up of two metallic parts, top and bottom.

As I was led up to the booth two men rose from behind the console. One of them was the same doctor who had taken me to Kraftstudt the day before, the other—a wizened old man whom I didn't know, with sparse hair disciplined into perfect smoothness on a yellow crane.

"Failed to persuade him," the doctor said. "I knew as much. I could see at once that Rauch belonged to the strong type. You will come to a bad end, Rauch," he said to me.

"So will you," I said.

"That's as may be, but with you it's definite."

I shrugged.

"Will you go through it voluntarily or do you want us to force you?" he then asked, looking me over insolently.

"Voluntarily. As a physicist I'm even interested."

"Splendid. In that case remove your shoes and strip to the waist. I must examine you first and take your blood pressure."

I did as I was told. The first part of "registering the spectre" looked like an ordinary medical check-up—breathe, stop breathing and the rest of it.

When the examination was over the doctor said:

"Now step into the booth. You've got a mike there. Answer all my questions. I must warn you that one of the frequencies will make you feel an intense pain. But it will go as soon as you yell out."

In my bare feet I stepped on to the porcelain floor. An electric bulb flashed on overhead. The generator droned. It was operating in the low-frequency band.

The tension of the field was obviously very high. I felt this by the way waves of warmth swelled and ebbed slowly through my body. Each electromagnetic pulse brought with it a strange tickling in the joints. Then my muscles began contracting and relaxing in time to the pulses.

Presently the frequency of the warmth waves was increased.

Here it goes, I thought. If only I can bear it. When the frequency reached eight cycles per second I would want to sleep. If only I could fight it. If only I could fool the blackguards. The frequency was slowly increasing. In my mind I counted the number of warm tides per second. One, two, three, four, more, still more. .. . Then sleepiness was on me with overwhelming sudden-ness. I clamped my teeth together, willing myself into wakefulness. Sleep was pushing me under like an enormous clammy weight, bearing me down, loading my eyelids. It was a miracle I was still on my feet. I bit my tongue, hoping pain would help me throw off the nightmarish burden of sleep. At that moment, as if from afar, a voice came to me:

"Rauch, how do you feel?"

"Not bad, thank you. A bit cold," I lied. I didn't recognise my own voice and bit my lips and tongue as hard as I could.

"Don't you feel sleepy?"

"No," I said, though I thought I would drop into sleep the next moment. And then, abruptly, all sleepiness was gone. The frequency must have been increased beyond the first terminal threshold. I felt fresh and cheerful as after a good snooze. Now I must fall asleep, I thought, and, shutting my eyes, snored away. I heard the doctor say to his assistant:

"Odd. Sleep at ten cycles instead of eight and a half. Write it down, Pfaff," he told the old man. "Rauch, your sensations?"

I didn't reply, still snoring loudly, my muscles relaxed, knees stuck against the side of the booth.

"Let's go on with it," said the doctor. "Increase the frequency, Pfaff, will you."

In a second I "woke up". The frequency band through which I was now passing made me experience a whole gamut of emotions and changes of mood. I was sad, then gay, then happy, then utterly miserable.

"Time I yelled out," I suddenly decided.

At the moment the generator's roar increased I yelled all I could, whereupon the doctor immediately ordered:

"Cut the tension! It's the first time I've met such a crazy type. Write down: pain at seventy-five cycles per second when normal people experience it at one hundred and thirty. Go on."

That frequency is still in store for me, I thought in dread. Will I be able to cope with it?

"Now, Pfaff, try the ninety-three on him."

When the frequency stabilised something entirely unexpected happened to me. I suddenly remembered the equations which had brought me to Kraftstudt and with perfect clarity visualised every stage of their solution. This is the frequency which stimulates mathematical thinking, I thought fleetingly.

"Rauch, name the first five members of the Bessel function of the second order," the doctor demanded.

I rattled off the answer. My head was crystal clear and my whole being was permeated with a wonderful feeling of knowing all and having it on my tongue's tip.

"Name the first ten places of it."

I named them.

"Solve a cubic equation."

The doctor dictated one with unwieldy fractional coefficients.

In two or three seconds I had the solution ready, naming all the three roots.

"Let's go on. He's quite normal in this department."

Slowly the frequency increased and I felt maudlin. There was a lump in my throat and tears welled in my eyes. But I laughed. I roared with convulsive laughter as if being vigorously tickled. I laughed, while the tears rolled down my cheeks.

"Some idiotic idiosyncrasy again. In a class of his own, you might say. I at once knew him for a strong nervous type subject to neuroses. When will he winge, I wonder?"

I "winged" when weeping was farthest from my mood, when all of a sudden my heart was overflowing with buoyant happiness as a nuptial cup with good vine. I wanted to troll and laugh and dance for joy. All of them—Kraftstudt and Boltz and Deinis and the doctor—seemed to me capital fellows, the jolliest chaps I had ever met. It was then that, with great effort, I started to whimper and blow my nose loudly. Though ghastly inadequate, my weeping soon elicited the now familiar comments of the expert:

"Oh, what a type. All upside down. Nothing even remotely resembling the normal spectre. This fellow will give us a lot of trouble."

How far is the one hundred and thirty? I thought, in abject terror, when the happy and carefree sensation had given way to a feeling of worry, ungrounded anxiety, the presage of impending doom.... I started humming a tune. I was doing it mechanically, with a great effort, while my heart pounded away in premonition of something terrible, something fatal and inevitable.

I at once knew when the frequency approached the one stimulating the sensation of pain. At first there was just a dull ache in the joints of the thumb on my right hand, then a sharp pain seared through an old war-time wound. This was followed by a terrible toothache spreading at once to all the teeth. Then a splitting headache added.

Blood pulsed painfully in my ears. Shall I be able to stand it? Shall I have enough will-power to overcome the nightmarish pain and not show it? People have been known after all to be done to death in torture chambers without groaning once. History has recorded cases of people dying on the faggots mute....

The pain went on increasing. Finally it reached its peak and my whole body became one knot of gnawing, stinging, racking, throbbing, excruciating pain. I was all but unconscious and saw purple specks revolving before my eyes, but I remained silent.

"Your sensations, Rauch," the doctor's voice penetrated to me.

"A sensation of murderous rage," I muttered through clenched teeth. "If I only could lay my hands on you...."

"Let's go on. He's completely abnormal. Everything's the other way round with him."

And when I was on the verge of passing out, ready to scream or groan, all pain was suddenly gone. There was sweat, clammy and cold, all over my body. My every muscle trembled.

Later some frequency made me see a blinding light which was there even when I shut my eyes, then I experienced wolfish hunger, heard a scale of deafening noises, felt cold as if taken out into the frost without a stitch on. But I persisted in giving the doctor wrong answers until he fumed with rage. I knew I still had one of the most terrible tests mentioned in the ward the day before coming to me: loss of will-power.

It was will that had seen me through so far. It was this invisible inner force that had helped me fight the sensations created artificially by my tormentors. But they would get at it eventually with their hellish pulse generator. Now, would they be able to find I had lost it? I waited for that frequency in dread. And it came.

Suddenly I felt indifference. Indifference to being in the hands of the Kraftstudt gang, indifference to him and his associates, indifference to myself. My mind was a complete blank. The muscles felt flabby. All sensations were gone. It was a state of total physical and moral spineless-ness. I couldn't force myself to think or make the slightest movement. I had no will of my own.

And yet, surviving in some remote corner of my consciousness, a tiny thought insisted: You must ... you must . . . you must.

You must what? Why? Whatever for? "You must ... you must ... you must," kept on insisting what seemed to me a single nerve cell by some kind of miracle impervious to the all-powerful electromagnetic pulses that held sway over my nerves, bidding them to feel whatever those hangmen wanted.

Later, when I learned about the theory of the central encephalic system of brain activity, according to which all the nerve cells in the cortex are governed by a single, master group of nerve cells, I realised that this supreme psychic authority was impervious even to the strongest outside physical and chemical influences. That must be what saved me then.

Suddenly the doctor ordered:

"You will collaborate with Kraftstudt."

I said:

"No."

"You will do all that you are told to do."

"No."

"Run your head against the wall."

"No."

"Let's go on. He's abnormal, Pfaff, but mind you we'll get at him yet."

I shammed loss of will-power just when a sensation of the strongest will flooded my whole being and I felt I could make myself do the impossible.

Checking on my "abnormalities" the doctor put me a few more questions.

"If the happiness of mankind depended on your life, would you give it?"

"Why should I?" I asked dully.

"Can you commit suicide?"

"Yes."

"Do you want to kill the war criminal, Obersturmfuhrer Kraftstudt?"

"What for?"

'Will you collaborate with us?"

"Yes."

"Damned if I can make anything out of him! I hope it's the first and the last time I have such a case to deal with. Loss of will-power at 175. Write that down. Let's go on with it."

And they went on for another half-hour. Finally the frequency chart of my nervous system was complete. The doctor now knew all the frequencies by means of which I could be made to experience any sensation or mood. At least he thought he did. Actually the only genuine frequency was the one which stimulated my mathematical abilities. And that was just what I needed most. The point was that I had evolved a plan of blowing the criminal firm sky-high. And mathematics was to be my dynamite.

It is an established fact that hypnosis and suggestion work best on weak-willed individuals. That was how the Kraftstudt personnel instilled in the calculators—their wills generator-treated— awed obedience and reverence towards their "teacher".

I, too, was to pass through an obedience course, but because of my "abnormal" spectre this ;was postponed for a time. I required an individual approach.

While a working place was being specially set up for me I had comparative freedom to move about. I was allowed to go out of the ward into the corridor and glance into the class-rooms where my colleagues studied or worked.

I was not allowed to join in the common prayers held between the walls of a huge aluminium condenser for half an hour every morning, during which Kraftstudt's victims paid homage to the firm's head. Devoid of will and thought, they dully repeated words read to them over a closed-circuit broadcast system.

"Joy and happiness lie in self-knowledge," announced the relayed voice.

"Joy and happiness lie in self-knowledge," the twelve men on bended knees repeated in chorus, their will-power destroyed by the alternating current field "between the walls".

"By understanding the mysteries of the circulation of impulses across neurone synapses we achieve joy and happiness."

"... joy and happiness," repeated the chorus.

"How wonderful that everything is so simple!

What a delight it is to know that love, fear, pain, hatred, hunger, sorrow, joy are all nothing but movement of electrochemical impulses in our bodies!"

"... in our bodies."

"How miserable he who does not know this great truth!"

"... this great truth," repeated the slaves dully.

"Herr Kraftstudt, our teacher and saviour, gave us this happiness!"

"... happiness."

"He gave us life."

"He gave us life."

I listened to this monstrous prayer, peeping through the glass-panel door of a class-room.

Inert and flabby, with eyes half-closed, the men repeated the nightmarish maxims in expressionless voices. The electric generator hardly ten paces away pumped submission into their minds robbed of resistance. Something inhuman, vile to the extreme, bestial and at the same time exquisitely cruel was being done to them. Boggled for comparison at the sight of that herd of miserable creatures with no will of their own, my mind could only suggest dipsomania or drug-addiction at their worst.

The thanksgiving over, the twelve passed into a spacious hall with rows of desks. Suspended over each desk was a round plate of aluminium forming part of a mammoth condenser. A second plate was apparently sunk in the floor.

This hall reminded me somehow of an open-air cafe with shaded tables. But the idyllic impression was swept away as soon as I looked at the men under the plates.

A sheet of paper setting out the problem awaited each one of them. At first the calculators looked at these in dumb incomprehension, still under the influence of the will-destroying frequency. Presently the frequency of ninety-three cycles was switched on and a crisp order to begin work relayed.

And all the twelve, snapping up pad and pencil, pitched into feverish scribbling. This could not be called work. It was frenzy, a kind of mathematical epilepsy. The men writhed and squirmed over their pads, their hands shuttled to and fro till they blurred; their faces turned deep purple with the strain; their eyes started out of their sockets.

This lasted for the best part of an hour. Then, when their hands started moving jerkily, heads lowered almost to the table-tops and livid veins swelled rope-like in their extended necks, the generator was switched to eight cycles. All the twelve at once dropped asleep.

Kraftstudt saw to it that his slaves got some rest!

Then it all began afresh.

One day, while watching this horrible scene of mass mathematical frenzy I saw one of the calculators break down. Suddenly he stopped writing, crazily turned to one of his furiously writing neighbours and stared at him blankly for a while as if at great pains to remember something.

Then he gave a terrible guttural cry and began tearing his clothes. He bit himself, gnawed at his fingers, tore skin off his chest, battered his head on the table. Finally he passed out and slumped down on the floor.

The rest paid not the slightest attention, their pencils still working feverishly.

I was so enraged that I started pounding on the locked door. I wanted to call out to the poor devils, tell them to have done with it, to break out and fall on their tormentors. . . .

"Don't get so worked up, Herr Rauch," I heard a calm voice beside me. It was Boltz.

"You are criminals! Look what you're doing to people. What right have you to torture them?"

He smiled his bland intellectual smile and said:

"Do you remember the myth about Ulysses? The gods offered him the choice between a long but quiet life and a short but turbulent one. He chose the latter. So did those men."

"But they were not offered any choice. It's you who aided by your pulse generator chose to stampede them toward self-annihilation for the sake of dividends!"

Boltz laughed.

"Haven't you heard them say they are happy? And so they are. Look at the way they're working in happy abandon. Does not bliss lie in creative labour?"

"I find your arguments revolting. There is a normal tempo in human life and it is criminal to try to accelerate it."

Boltz laughed again.

"You're not exactly logical, Professor. There was a time when people travelled on foot or horseback. Nowadays they fly by jet. News used to spread from mouth to mouth, taking years to snail-pace round the globe; now radio brings events right into your home even as they happen. Present-day civilisation accelerates the tempo of life artificially and you don't think it's a crime. And the host of all sorts of artificial amusements and delights, aren't they too accelerating life's tempo? So why should you consider artificial acceleration of the functions of a living organism a crime? I'm certain that these people, were they to live a natural life, would not be able to do a millionth part of what they can do now. And the meaning of life, as you know, is creative activity. You will fully appreciate that when you become one of them. Soon you will know what joy and happiness are! In fact, in two days' time. A separate room is being set up for you. You will be working .there alone, because, you will excuse my saying so, you are somewhat different from normal people."

Boltz slapped me amiably on the shoulder and left me alone to ponder his inhuman philosophy.

In accordance with my "spectre" they started my obedience training at a frequency which gave me enough will-power to achieve a feat of defiance. My first feat was easy: again I shammed loss of will-power. Kneeling down and staring ahead as vacuum-eyed as I possibly could, I repeated dully the now familiar thanksgiving balderdash. In addition a few truths about neuro-cybernetics were inculcated in me as a novice.

They boiled down to remembering which frequencies stood for what human emotions. Out of these, two were particularly important for my plans: the one stimulating mathematical thinking and another, which, luckily, was not far from the ninety-three cycles.

My training lasted for a week, after which time I was deemed obedient enough .to be put to work. The first problem I was given was analysing the possibility of intercepting an IGBM.

It took me two hours to do. The result was not cheerful for the Ministry: it couldn't be done under .the conditions indicated.

The second problem, also of a military nature, was calculating a neutron beam powerful enough to set off an enemy's nuclear war-heads. The answer was again cheerless. A neutron cannon as calculated would have to weigh several thousand tons.

It was indeed a delight for me to solve those problems and I must have looked as possessed as the other calculators, with the difference, however, that the generator, instead of making me an obedient tool, was infusing me with confidence and enthusiasm. A joyous feeling of being on top of the world did not leave me even during the sleep breaks. I pretended to sleep but in reality I was working out my plans of condign punishment.

When I was through with the Defence Ministry problems I began to solve in my mind (so that nobody would know) the problem most important for me, how to blow Kraftstudt and Co. sky-high.

I meant the phrase metaphorically, of course, having no dynamite and no chance of obtaining any in that prison-like madhouse. Anyway blasting was no part of my plan.

Since the pulse generator could stimulate any human emotion, why not try to use it, I reasoned, to rouse human dignity in its victims and make them rebel against the ex-Nazi criminals? If this were possible they would require no outside help to smash this scientifically-minded gang. But was there a way to do it? Was there a way, that is, to change the frequency stimulating mathematical thinking for one that unleashed anger and hatred in man?

The generator was operated by its aged creator, Dr. Pfaff, an able engineer but apparently with a strong sadistic streak. As he obviously delighted in the perverse way his creation was used, I could not count on any help from him. Dr. Pfaff was absolutely out. The generator had to work on the frequency I required without his help or knowledge.

Now if a pulse generator is overloaded, that is, if more power is taken off than its design allows, the frequency drops. That means that by adding an extra load in the form of a resister, a generator can be made to operate on a frequency lower than shown on the dial.

Kraftstudt and Co. exploited mathematical thinking at a frequency of 93 cycles per second. Anger is produced by 85. That meant the frequency had to be cut down by a total of eight cycles! I started calculating an extra load to do that.

During my visit to the test laboratory I had noted the readings on the voltmeter and ammeter of the generator. Their product gave me its power. Now for the mathematical problem of an extra load....

I first traced in my mind the way the gigantic condensers inside which those poor devils slaved were connected to the generator. Then, in forty minutes, I solved the pertinent Maxwell equations and did all the other, most complex calculations.

It appeared Herr Pfaff had an excess of power of only one-and-a-half watts!

This was sufficient to calculate how a frequency of ninety-three cycles could be changed to one of eighty-five. All I had to do was to earth one of the condenser-plates through a resister of 1,350 ohms.

I nearly shouted with joy. But where could I get a length of wire of that resistance? I thought next. It had to be very exact, too, or the desired effect would not be achieved.

I feverishly cast my mind about for substitutes but could think of none. A feeling of impotence swept over me when a black plastic cup suddenly appeared in my field of vision in the act of being placed on my desk by a small trembling hand. I looked up and could barely suppress an exclamation of surprise: standing in front of me was the thin girl with frightened eyes, the one who had delivered the Kraftstudt mail to me.

"What are you doing here?" I asked under my breath.

"Working," she answered, hardly moving her lips. "So you're alive."

"Yes. I need you."

Her eyes darted about.

"Everyone in town thinks you were killed. So did I."

"You go to town?"

"Yes. Almost every day, but...." I caught her tiny hand and held it In wine. "Tell everybody in town, especially at the University, I'm alive and kept here by force. Tell them this tonight. My friends here and myself must get help to get out."

There was terror in the girl's eyes. "What are you saying?" she whispered. "If Hen- Kraftstudt gets to know, and he can find out anything...." '

"How often are you interrogated?" "Next time will be the day after tomorrow." "You've got a whole day. Screw up your courage. Don't be afraid. Do as I tell you, please." The girl snatched her hand away and hurried out.

There were pencils in the black cup. Ten of them altogether, of different colours for different purposes. Mechanically I took the first that came to my hand and fingered it: it was marked "2B", a very soft pencil. It had plenty of graphite, a fair conductor. Then came "3B" and "5B" pencils, then those of the "H" range, hard ones, for copying. As I fingered them my mind seethed in a turmoil of speculation. Then all of a sudden, like a flash of lightning, I remembered the specific resistances of pencil graphites: A "5H" pencil has a resistance of 2,000 ohms. The next moment I had a "5H" pencil in my hand. The problem was

Solved now not only mathematically but practically. There in my hand was a length of wood-enclosed graphite with the help of which I could bring punishment to a gang of modern barbarians.

I secreted the pencil in an inner pocket as carefully as a priceless 'treasure. Then it occurred to me where I could get two pieces of wire, one to connect to the condenser-plate over my desk, the other to the radiator in the corner, with the pencil graphite in between.

I remembered the table lamp in the ward where I lived with the other calculators. It had a flex which, being about five feet long, could be unwound into a forty-foot length of thin wire, which would be more than enough for the job.

I had just finished my calculations when the relayed voice announced dinnertime for the calculators.

I left my solitary cell in high spirits and made for the ward. Glancing back in the corridor, I saw the doctor look with obvious displeasure at the solutions of the problems I'd been given. Apparently the fact that there was no way of intercepting an ICBM or setting off the enemy's atomic bombs by a-neutron cannon was not to his liking. He had no premonition though of what *could* be done with ordinary graphite from a copying pencil!

The table lamp I had in mind had not apparently been in use for a long time. It stood in a corner on a high stool, dusty, fly-specked, its flex coiled tight round the upright.

Early in the morning when the inmates filed out to wash, I cut off the flex with a table knife and put it in my pocket. At breakfast I pocketed a knife and when everybody went out for the prayer I locked myself in the toilet. In a matter of seconds I had skinned off the insulation sheath and exposed numerous strands of thin wire, each about five feet long. Then I split the pencil gingerly, took out the graphite core and broke off three-tenths of its length. The remaining part should have the resistance I required. I made tiny notches at either end of the graphite where I secured the wires. The resister was ready. All that remained to be done was to connect it to the condenser-plate and then earth it.

That I could do during my work.

The calculators had an eight-hour working day with ten-minute breaks after each hour. After the lunch break, at 1 p.m., the hall where they worked was as a rule visited by the Kraftstudt and Co. executives. The head of the firm used to linger in the hall for some time, obviously enjoying the sight of twelve men writhing in mathematical throes. I decided it was the best time to change the frequency.

I went to my place of work that morning with the resister all ready in my pocket. I was walking on air. At the door I met the doctor. He had brought my problems for the day.

"Hey, sawbones, wait a minute," I called out to him.

He stopped in his tracks and looked me over, astonished.

"I'd like a word with you."

"Well, what is it?" he grunted.

"It's like this," I began. "It occurred to me while I was working yesterday to return to a conversation I had with Herr Boltz. I think I was rather rash. I wonder if you would let Herr Boltz know that I agree to teach maths to the firm's new draft."

"Good for you," he said with sincerity. "I told them that your spectre being what it is you should be set up as an overseer over that mathematical manure. We badly need an efficient overseer. Your working frequencies are all different. You could just walk among them and drive the lazy or those who have slipped out of resonance."

"Why, of course, doctor. But I think I'd better stick to teaching. God witness I don't feel like; bashing my head against a table-top like I saw a chap do the other day."

"Very sensible," he agreed. "I'll be speaking to Kraftstudt. I think he will agree."

"When will I know his decision?"

"By one o'clock, I expect, when we make our round of the premises."

"Good. With your permission I'll approach you then."

He nodded and walked off. On my desk I found a sheet of paper which gave me conditions for the calculation of a new pulse generator four times more powerful than the existing one. So Kraftstudt thinks of expanding his business, I thought. Yoking to it fifty-two calculators instead of the thirteen he has now. Almost lovingly I touched the pencil graphite with bits of wire in my pocket to make sure it hadn't broken.

The conditions of the problem showed me that my calculations in connection with the existing generator were correct. My hopes for success soared. I began looking forward to lunch break. When the clock on the wall showed a quarter to one I took out my device and connected its one end to a bolt on the aluminium plate above my' desk. The other end I lengthened with more pieces of wire until it was long enough to reach the radiator in the corner of the room.

The last minutes dragged painfully. At last the minute hand touched twelve. I quickly connected the wire to the radiator and strode into the corridor. Advancing towards me was Kraftstudt with Pfaff, Boltz and the doctor in attendance. At the sight of me they broke into smiles. Boltz motioned me to join them. I did so and we all stopped at the glass door of the room where the calculators worked.

Pfaff and Kraftstudt were in front and I couldn't see what was going on inside.

"That was a wise move," Boltz whispered to' me. "Herr Kraftstudt has accepted your offer. You won't regret it—"

"What's the matter?" Kraftstudt asked suddenly, turning on his retinue. Engineer Pfaff cowered; looking through the door with an odd expression on his face. My heart missed *a,* beat.

"They're not working! They're staring about, damn 'em!" Pfaff growled.

I pressed forward and looked through the glass panel. What I saw surpassed my wildest hopes. The men who before had bent so obediently over their desks were sitting upright now, looking about them boldly and speaking to one another in loud, resolute voices.

"It's time we put an end to it, boys. D'you realise what they're doing to us?" Deinis was saying aggressively.

"Of course we do. They've been drumming into us that we achieve happiness through their pulse generator, the bastards. I've a mind to help 'em achieve theirs!"

"What's happening there?" Kraftstudt queried threateningly.

"I've no idea," Pfaff mumbled, rolling his faded eyes. "They act as if they were normal! Why don't they go on with their work?" Kraftstudt was livid by now. "We won't be on time with at least five defence orders," he said through clenched teeth. "See that they-immediately-start working!".

Boltz snapped the lock open and our party trooped in.

"Stand up to greet your teacher and saviour," Boltz said loudly.

A pregnant silence was the answer. Twelve pairs of eyes full of anger and hatred blazed in our direction.

A spark was enough now to set it off. My heart sang with joy. Kraftstudt Co. was about to bust! I stepped forward.

"What are you waiting for? The hour of delivery has come. Your happiness is in your own hands. Go on, smash this criminal gang who wanted to see you all in the madhouse!"

No sooner had I finished than the calculators rushed from their places and fell on the petrified Kraftstudt and his party. They bore Boltz and the doctor down and started throttling them. They cornered Kraftstudt, punching and kicking him. Deinis straddled over the prone Pfaff and seizing his bald head by its ears drummed it against the floor. Some tore the aluminium awnings down, others smashed window-panes. The loudspeaker torn down by a calculator crashed to the floor, followed by the desks. The floor was strewn with sheets of calculations torn to bits.

I stood in the centre of that battle-field, issuing commands:

"Now don't let Kraftstudt get away! He's a war criminal! He's the kingpin of this hell on earth where you've been worked to madness! Hold tight that scoundrel Pfaff! He designed that pulse generator!

Give Boltz what he deserves! He recruited you and planned to recruit many more!"

And the men, splendid in their righteous wrath, punched, kicked and throttled their enemies. .

Though no longer under the influence of the generator they could not stop now in their noble indignation of people breaking free from thraldom. Kraftstudt and his party, torn and bleeding, were dragged into the corridor and to the exit.

I led the agitated men, hooting and jeering and cursing their former masters, through the win-dowless reception hall where I'd handed in my problems, through the narrow subterranean maze to the back door where we finally emerged into the open.

"We were blinded momentarily by a hot spring sun and we stopped short. But not only because of the sun. In front of the door leading to Kraftstudt's apartments pressed a huge crowd of people. They had been shouting something but at the sight of us suddenly went silent. Then I heard somebody call out:

"Why, this is Professor Rauch! So he is really alive!"

Deinis and his colleagues kicked forward the battered executives of Kraftstudt and Co. One after another they struggled to their feet and glanced cowardly from us to the crowd pressing threateningly round them.

A thin pale girl broke from the crowd. So she had found courage to do what I asked her!

"That's him," she said, pointing at Kraftstudt. "And him," she added, nodding her chin at Pfaff. "They started it all...."

A murmur came from the crowd. Voices were raised in anger. The people surged forward. Another moment and the criminals would have been torn limb from limb. But Deinis raised his hand.

"Friends, we're civilised people," he said. "We mustn't take justice into our own hands. The interests of humanity will be better served if we let the world know about their crimes. They must be brought to trial and we will all stand as witnesses. Within those walls heinous crimes have been committed. Taking advantage of the progress of science, those monsters were reducing men to slavery and exploiting them to the last spark of life."

"Bring the criminals to trial!" everybody shouted. "Bring 'em to trial!"

The crowd headed for town. The criminals were in a tight circle. Elsa Brinter, the thin girl, walked at my side. She clutched my hand as she spoke to me:

"I thought hard after our last conversation. Then I somehow felt strong and brave. And very angry for you and your friends and myself too."

"That's what always happens to those who hate their enemies and love their friends," I said.

Kraftstudt and his associates were handed over to the town authorities. The Burgomaster made along speech studded with biblical references. He ended by saying: "For crimes so subtle in their cruelty Herr Kraftstudt and his colleagues will be tried by the Federal Court of Justice."

Then they were taken away in police vans, and have not been heard of since. Nor have there been any reports in the press. But it has been rumoured that Kraftstudt and his colleagues entered government service and were entrusted with setting up a large computer centre for the Defence Ministry.

I always boil with indignation now when looking through a newspaper I find on the last page this perennial advertisement:

WANTED

for work at a large computer centre men
aged 25-40 and having knowledge of higher
mathematics. Write to Box***

THE VALLEY
OF
THE FOUR CROSSES

BY
IGOR ZABELIN

Igor Zabelin (b. 1927) is a geographer by profession, specialising in the theory of physical geography. Far from being the armchair scientist type he has explored the remotest areas of the Soviet Union, such as Tuva, Buryatia, Chukotka and Tien Shan, where he collected a wealth of material for his spare-time writing.

He delights in depicting the hard and adventurous life of geographers and pioneers and unravelling the mysteries of lost expeditions – such as he does in his “Valley of the Four Crosses” which is included in this volume.

CHAPTER I

WHICH TELLS HOW IT ALL BEGAN, WHY WE UNDERTOOK TO INVESTIGATE THIS MYSTERIOUS AFFAIR, AND WHAT A CHRONO-SCOPE AND CHRONOSCOPY ARE.

The story I am about to tell you began, as scores of other stories do, with a bundle of old papers found in the attic of an old house. Only we did not have to creep, candle in hand, up creaking stairs into a cobwebby attic to get them:

Somebody from the Geology and Geography Department of the U.S.S.R. Academy of Sciences rang me up and asked would my friend Beryozkin and I please call on them any time that day.

We were received by Danilevsky, a middle-aged man with greying temples.

From one of the drawers of his desk he produced two battered notebooks with rust smudges all over the covers, and placed them in front of us.

"There you are," he said. "That is the reason why we asked you to come. Those notebooks were received by the Presidium of the Academy from the Krasnodar Local Lore Museum about six weeks ago. In the covering letter the curator says the notebooks were found in the attic of a derelict house on the city's outskirts. It's nothing short of miracle, their surviving the Civil War and the Nazi occupation....”

"You think they're that old?" I asked.

"There's not the slightest doubt. The local people have established that it's a diary with the first entry made some time before the 1917 Revolution and the last in 1919. It's devilishly hard to make out the writing, but one thing clear at this stage is that it deals with Andrei Zhiltsov's arctic expedition."

"Zhiltsov?" I repeated, surprised. "You mean that expedition which vanished without leaving a trace?"

"Exactly. But read the covering letter...."

The letter told us nothing we didn't already know, except for the author's name: the curator supposed that the diary had belonged to Zaitsman, a member of the expedition. After reading the letter we looked at the notebooks with added curiosity.

"You seem to be warming up to it," Danilevsky, who had been observing us, said. "Now would you two agree to investigate the matter?"

"You mean decipher the notes?"

"I don't know. But that to start with. The Presidium's prepared to give you any help needed."

"But why ask us?"

"Well, there's plenty of good reasons for that, Comrade Verbinin. We're well aware that for years now you've been studying the development of the North from a historical angle and recently published a monograph on the subject. Besides, being an author, you might be interested in this as a mystery story. Finally, the chrono-scope, your joint invention...."

Oh, yes, I thought, of course, the chrono-scope, that's the explanation.

"To be exact," I said to Danilevsky, "it was Comrade Beryozkin who invented the chrono-scope. It just happened that the idea came to both of us at the same time." Here my friend, a man of few words, started to fidget in his chair, which I ignored. "But that's neither here nor there. The trouble is the chrono-scope hasn't yet passed all the necessary tests." Here I turned to Beryozkin for support. "And there's no guarantee it'll live up to our expectations."

"No guarantee," repeated Beryozkin. Squat and broad-shouldered, with a big head, bumpy forehead and massive lower jaw, he rather gave the impression of being a slowcoach—physically and mentally. Nobody would recognise in him at first meeting the brilliant mathematician and inventor that he was.

"As a matter of fact," said Danilevsky, "we're in this case more interested in the lost expedition than in the chrono-scope. But it's entirely up to you two to decide whether you take it on or not."

I replied that we must give the matter further thought, to which Danilevsky agreed and suggested we take the notebooks along to have a closer look at them.

Having wrapped them carefully and put them into my brief case we took our leave.

It seems to me it is time to tell you about the chrono-scope and chronoscopy.

At the time we were asked to investigate the mystery of the lost expedition we had just finished preliminary work on the chrono-scope and were about to test it thoroughly before applying for a patent. Privately we were of course convinced that that apparatus was perfection itself, but when actually offered the opportunity of immediate use we quailed and beat a temporary retreat.... There had been rumours abroad, and even a few sketchy press reports, about the chrono-scope, but, with a few exceptions, everyone treated it as a big hoax. Not that we didn't see the reason: there were only two chronoscopists in the whole world— Beryozkin and myself—and the successes of chronoscopy had been so far negligible.

Strictly speaking, the story which I am telling you had begun before we first saw the battered old notebooks and even before they were found in the attic of a derelict house. It had begun much earlier, on a dark starry night deep in the taiga, when the idea of chronoscopy was first conceived.

Our small party of geographers was travelling in the Eastern Sayans. For two days, from early morning till late afternoon, we had been following a bridle-path in the Irkut valley, doing our routine work of noting terrain, vegetation, etc. On the third day we left the valley and began the climb to the Nukhu Daban Pass (meaning "pass with a hole" in Buryat). We all had heard and read a lot about the famous pass and were rather looking forward to seeing it. The climb was steep and hard, and though the pass was quite negotiable in local opinion, A peculiar sacrificial place we found just below it, at the base of a vertical cliff, convinced us that the herdsmen and hunters who used the pass stood in a certain awe of it. I went across to have a look at the sacrificial offerings, a few coloured ribbons tied to the branches of a larch, strings of glass beads, a handful of copper coins, and even a few one-ruble notes, each rolled up tightly. Hardly any one of these people, it occurred to me, had really believed that his offerings would help him, but it was a local tradition hallowed by centuries and it persisted. We, no believers in the supernatural, placed a few coppers too and, feeling somehow the happier for it, went on with the hard climb. At last we topped the Nukhu Daban and saw, to the right of the path, a calcareous cliff with a gap in it, a few stumpy larches clinging to its sharp craggy edges. I went closer and, on one of its projections, found an ancient helmet. There was nothing there to suggest who had placed it there and when or why. But what with the famous pass, the sacrificial altar and now the helmet, we were all swept by a romantic mood, and when we descended into the Oka valley and halted for the night everybody was full of talk about the ancient times in general and the history of those parts in particular.

I had carried the helmet with me and, together with Beryozkin, examined it carefully by the light of the camp-fire. It was an amazingly big fit as though it had once crowned the head of a fairytale giant. None of us had a head anywhere near the size. It was fashioned out of eight steel plates riveted together and reinforced at the base by an iron band, and had a narrow peak in front and a ring with a centre tube—apparently for decorative tufts of horsehair or something—on top.

The quiet night, the river murmuring along its stony bed, the cold breath of wind coming from the pass, the sparks flying into the darkness and the waning moon above the mountaintops—all spurred on our imagination until we could quite easily see a powerful Mongol warrior in full battle dress ride along the path and then slump in his saddle, struck dead by a treacherous arrow. And then someone—we could never remember afterwards who it was—expressed his regret that there was no way of seeing for oneself events which had happened ten, a hundred or three hundred years before, of bringing them closer, as it were, like a telescope brings closer to us things that are many thousands and even millions of miles away....

It was then that the word "chrono-scope" was coined, as a joke, by analogy. A telescope brings things closer in space and, well, a chrono-scope would bring them closer in time, make the dim past as clear as the present.

By this time the owner of the helmet was so real in my own imagination that I said, in dead earnest, "But we've got the device, we've had it a long time."

All looked at me in surprise.

"It's the brain," I explained. "The human brain. Would you deny that it has been remarkably successful in unravelling our past and reviving centuries-old events for us? Haven't we formed a very good idea of our forefathers' everyday life and methods of warfare through our finds of tools and weapons they used? Don't many historical novels and films give us a truthful picture of life in the days gone by?"

"That's hardly to the point," said one of our companions. "Man can imagine conditions on, say, Mars, but that'll never replace the telescope...."

"Nor will any telescope replace the human brain, you see," I said, holding my ground. "If it's a question of providing another aid—"

"Not just another aid," cut in Beryozkin, who, until then, had not opened his mouth. At the time he was a maths undergraduate at Moscow University and love of travel had made him join our expedition as a manual worker. "Not just another aid," he repeated. "Of course, neither a telescope nor the cleverest chrono-scope will ever be capable of thinking, but what a boost man's thinking would get if new, unexpected facts could be discovered! The brain alone can conceive history but a chrono-scope could provide the necessary facts. True enough, all sorts of fantastic notions race in our brains and we people Mars and proclaim tectonic cracks an irrigation system, but only the telescope gives us facts about the true nature of Mars. The way we interpret historical facts is largely conjectural and subjective; if the chrono-scope could bring those facts closer to us undistorted by the historians—"

"Why, that would lead to a revolution in history and in archaeology," I said, unable to contain myself. "Man's prospects of knowledge would become unlimited."

"Oh, stop it," somebody said. "Chrono-scope this, chrono-scope that. What's the use talking about it when you know perfectly well the thing can never be made."

"Yes it can," Beryozkin said firmly. "Not in the form of a tube with a system of lenses, to be sure, but—"

"But in what form?" I asked, suddenly aware that Beryozkin was in dead earnest and that the idea we had been toying with could be placed on a real, even if as yet incomprehensible to me, basis.

"An electronic machine," said Beryozkin. "Yes, an ordinary electronic machine." After a pause, he added, "Not exactly ordinary, of course, but of the computer type. The kind that can solve the most complex mathematical problems, translate from foreign languages and store in their memories multitudes of different things. Cybernetics is so far advanced one can have a good idea how a chrono-scope would work. Suppose, there is a hole in that helmet. We place the helmet into the machine, which we programme to discover the origin of the hole. Within a few seconds the machine will have considered hundreds, thousands or, perhaps, tens of thousands of possible solutions and chosen the most probable. This last variant is photographed by means of photocells and then projected on to the screen. And then—"

"And then the past would come to life on the screen," I interrupted Beryozkin's daydreaming. "We'd see the Mongol warrior slowly ascending the Nukhu Daban Pass, and his enemy lying in ambush behind some rocks; then .we'd see how, without warning, he'd bend his trusty bow and unsaddle the carefree warrior with a death-dealing barbed arrow."

This brought general laughter in which Beryozkin and myself joined—it was really too fantastic for words.

Many years had elapsed since that night and the chrono-scope was there. It is hardly worth while to recall in detail the long and arduous years which the invention had cost us, all our failures and disappointments, the doubts that had sometimes assailed us. That being all a matter of the past and success having crowned our labours, we were apt to regard it all, as is usual in such cases, through rose-tinted spectacles. We had been motivated by a great idea, we wanted to make a device which would open out a window on the distant and near past; a device which, using the scantiest material evidence, would quickly and unerringly piece together a heroic feat or heinous crime, expose the slanderer and rehabilitate the slandered. We did not yet know all the possibilities of our invention; perhaps in time it would help the palaeontologist see with his own eyes long-extinct denizens of the Earth, the archaeologist to study work habits of primitive man, the historian to restore episodes of the Battle of Borodino or the "Battle of the Nations" at Leipzig....

In short, we had always believed, as we all the more do now, that chronoscopy—the art of seeing the past—has a great future.

However at the time the old notebooks from Krasnodar appeared on our desk, though we were as enthusiastic as ever about our machine, we had no real achievements to boast of. Of course, we were quite happy about the chrono-scope having been able to flash an image of my wife writing after studying an old letter of hers, but that was hardly enough for official recognition.

So, as you will appreciate, Zaitsman's notebooks had arrived just at the right time.

Now that I am writing this story our work is finished, the past has been reconstructed and pictures of it are stored in the "ever green" memory of the machine, to be flashed on to the screen at a moment's notice. I remember in clear detail all the stages of the investigation, the persistence and patience required of us to unravel this puzzle of psychologies in conflict. It is all over now and can be seen in perspective, but I am puzzled by the question: What shall I write about? And don't be surprised. For this can be a story about the way the first chrono-scope was tested. But it can also be a story about the people whom we met on the screen—and not only on the screen. We—Beryozkin and myself—are very fond of the child of our brain, but people with their joys and sorrows are still dearer to us.... So, as the investigation progressed we concentrated less and less on testing the chrono-scope and more and more on solving the mystery of the lost expedition. I think that's what this story will be about—about what we have discovered. And the chrono-scope? Well, there will be something about it too.

CHAPTER II

CONTAINING MORE INFORMATION ABOUT ZHILTSOV'S EXPEDITION AND DESCRIBING THE FIRST REAL TEST OF THE CHRONO-SCOPE AND ITS RESULTS.

On leaving the Academy of Sciences we went straight to my rooms as we wanted to consider the matter from all angles before giving our final decision.

"Well, old man," said Beryozkin, having ensconced himself in his favourite place beside my desk. "There's always that nothing-venture-nothing-have line of argument, of course. But first I'd like to hear all you know about that expedition. I'm not so well versed in the annals of geography, as you know, and taking on something of which you don't know much—"

He didn't finish but I understood his meaning perfectly. I too felt that we could only risk the reputation of our chrono-scope for something which was really important. But I for one had no doubts on that score: if it really was Zhiltsov's expedition it *was* important.

Evening was drawing near, we were both tired after the day's work and I asked my wife to make us some tea. While she busied herself in the kitchen, I took a few books down from a shelf and stacked them neatly on the desk.

"You see," I told Beryozkin, "all we know for certain about this expedition is that it sailed away for the North and disappeared without a trace...."

"Not much," Beryozkin grinned ruefully. "But what about its aim. Don't we know anything about that, or about its .leader, Zhiltsov?"

"Yes, we do," I said. "Andrei Zhiltsov was an authority on polar hydrography. He took part in Toll's famous expedition on the *Zarya—"*

"Let's have some order," my friend interrupted me. "I've heard about Toll's expedition, I know that he died, but I was never interested enough to find out the details. And it's details that we want now, if we are to get any leads in the matter."

"Right you are, it's details that count now, and I've just remembered an interesting one. But first about the expedition on the schooner *Zarya.* It was sponsored by the Academy of Sciences for the purpose of surveying the New Siberian Islands and searching for Sannikov Land. Now you will ask what Sannikov Land is?"

"No, I won't," Beryozkin said in a slightly offended tone. "It's a land a hunter, Sannikov, reported early last century north of Kotelny Island. It's been written about ever since and searched for and never found."

"Quite. But as a matter of fact Sannikov was not the only one who saw it. Jergeli, an Evenk, saw it several times and so did Toll. In 1886, he was making a study of the New Siberian Islands with the polar explorer Bunge, and like Sannikov, he sighted land to the north of Kotelny Island. He believed so implicitly in its existence that he even tried to forecast its geological structure from the shape of the mountains he had seen. He made its discovery the aim of his life. And it was the purpose of the *Zarya* when she put to sea in 1900, bound for the New Siberian Islands. But two years later Toll was dead, together with Seeberg the astronomer and two hunters—Evenk Dyakonov and Yakut Gorokhov. They worked on Bennett Island, where the *Zarya* was to call for them. However the schooner, after two unsuccessful attempts to get through, returned to the mouth of the Lena. Ice conditions were exceptionally bad that year but it is known that hydrographer Zhiltsov insisted they go on trying to reach the island, while Matisen, the ship's captain, decided it was too risky.... It is anybody's guess which of them was right. But the retreat of the *Zarya* cost Toll's party their lives. Zhiltsov wrote later that Toll's death had greatly affected him and that he had resolved to finish what the late explorer had begun. That was the reason for Zhiltsov's expedition. He was instructed to find and survey Sannikov Land, then proceed via the Bering Strait into the Pacific. The expedition began just before the First World War; it set out from Yakutsk—" "And vanished," Beryozkin summed up for me. "That's right—the general opinion being that the whole expedition perished either in the pack ice of the Arctic Ocean or in some remote place on its coast. There have been similar cases. Brusilov's expedition on the *St. Anna,* Rusanov's expedition on the *Hercules,* one of the parties of the De Long expedition after the loss of their ship *Jeannette*—all perished in the same way. But if Zaitsman had survived and lived in Krasnodar in nineteen.... He could hardly have survived alone, that's extremely unlikely."

My wife poured out two glasses of strong, almost black tea for us and sat down out of our way on the sofa. We drank the tea and continued the conversation.

"I think it's highly unlikely that the expedition discovered anything of importance," I went on, "but I do think we are dealing here with an example of bravery. If these people all perished, fighting the superior forces of Nature—or probably not only of Nature—it is our duty to tell the story of their heroism."

"Why don't you go and open the notebooks? You might not need your chrono-scope after all," my wife put in with a tinge of irony; ever since we had chronoscoped that letter of hers she had been prejudiced against the machine and was even a bit afraid of it, I thought.

We followed her wise advice and, taking every precaution, turned over the pages, one by one. The notebooks were indeed in a sorry state and the workers of the Krasnodar Local Lore Museum could not be blamed for having gleaned so little out of them. There were two lines of action open for us: either enlist the help of criminologists and try to decipher all that was still decipherable, or place our trust in the chrono-scope. We decided that we might make some use of the first line but would concentrate on the second, as we thought it would save us time and allow us to test the machine. We decided to begin by chronoscoping the last pages of the second notebook. These were in fairly good condition, but the handwriting was unintelligible and faltering as of a man dying. Many lines trailed off and were then resumed, probably when Zaitsman had rested enough to make another effort. It all gave us an impression that Zaitsman, the last ounces of his strength ebbing out of him, strove to commit to paper something very important, something which he felt he had no right to carry with him to the grave. We were convinced that, once deciphered, those pages would tell us the main thing: what happened to the expedition and to its findings, if any.

When we were about to leave for Beryozkin's Institute, I remembered that in one of the books there was a list of the members of Zhiltsov's expedition. I found it quickly and read aloud:

1. Zhiltsov, Leader, Hydrographer
2. Lieut. Cherkeshin, Ship's Captain
3. Mazurin, Astronomer
4. Konoplyov, Ethnographer and Zoologist
5. Desnitsky, Doctor
6. Govorov, First Mate

"That's funny," was all Beryozkin could say. "Zaitsman's not in the list." And he stared at me for an explanation but I was stumped.

"Well, let's not rack our brains over that," I suggested. "The chrono-scope's sure to give us some kind of lead. Come on, let's go to the Institute."

The machine was installed in Beryozkin's office. As he was programming it I settled in the chair—on tacit agreement Beryozkin handled the knobs—and prepared to look in.

For a few moments, which seemed to us an eternity, the screen remained blank; then it became luminous but there was no image until at last we saw a man under a grey Army greatcoat lying on a heap of straw. He was tossing about as if in a fever and his lips were moving—in a delirium, I thought; clutched in his hand was the very notebook the last pages of which had just been fed into the machine.

A typical Civil War typhus case, I thought and was on the verge of saying as much when, of a sudden, a hollow voice began speaking in the room. It had come so unexpected it fairly made me jump up. For a fleeting moment I was under the Illusion it was the sick man speaking, then I realised that the machine had started deciphering. "Can't leave it unrecorded.... It's a torment.... My conscience.... Everybody must know.... Driven out to die.... We owe our lives..." the metallic voice uttered the words with indifference. "My conscience.... My conscience.... Were we right?... Who can tell?... Can't go on living 'like this.... Were we right?... He saved everybody...." Even as the chrono-scope was carefully uttering the last words—words which concealed some tragedy, some anguished recollection striving desperately for expression—the man on the screen opened the notebook and, with a failing hand, wrote something down in it; then he tucked the book in his breast pocket laboriously and lay immobile, no longer interested in this world's problems. Meanwhile the machine repeated once more, "Were we right?" And then, after a short pause, came suddenly a name: "Cherkeshin." There was a click as the loudspeaker switched off; the image faded away; the chrono-scope could do no more.

For some time we sat on in the darkness. I seemed still to see the emaciated face of that disease- and doubt-ridden man, his tangled greying beard, his matted, once black hair.... I knew it was Zaitsman we had seen. The image might be a far cry from perfect likeness, but having been given all we knew and adding to it what it could learn from the text and the man's handwriting, the machine had chosen out of thousands of variants the one in which we immediately "recognised" Zaitsman.

But it wasn't so much Zaitsman or even the successful outcome of the test, as the mystery the dying man had tried to communicate, that was uppermost in our minds. The strain having been too great, however, we wanted to relax and the conversation that ensued was rather desultory.

"Who was in Krasnodar in nineteen? Denikin's Whiteguards? What could Zaitsman have been doing there?"

"Pretty well anything," I said, shrugging my shoulders. "Just living, or fighting, or hiding...."

"Of course, we don't know much about him, do we? But suppose he's still alive? He could have lost his notebooks, couldn't he?"

"No, he's dead. That's certain, I'm afraid—or he would've told about the expedition."

Presently we left the Institute and walked home through Moscow's night-stilled streets.

"The machine did a splendid job, though," Beryozkin said in a sudden burst of pride.

"You bet," I said.

When we had already said our good-byes, Beryozkin asked:

"Why did he remember Cherkeshin alone? Perhaps *he* was at the root of all the trouble?"

"Let's try and make some sense of it tomorrow," I replied. "But it does rather seem to me that what really happened to the expedition is more complicated than I'd thought. In any case these last pages have not thrown much light on the matter...."

"Made it more obscure, I should say."

"Tomorrow we'll sit down to it and start deciphering the first notebook. We overplayed our hand, if you ask me. We should follow the chain, link by link."

CHAPTER III

CONTAINING AN ACCOUNT OF WHAT WE MANAGED TO LEARN FROM ZAITSMAN'S NOTEBOOKS AND OF NEW DISAPPOINTMENTS THAT AWAITED US, TOGETHER WITH SOME INFORMATION OF A HISTORICAL NATURE, MAINLY ABOUT THE CONTRIBUTION OF POLITICAL EXILES TO SIBERIAN EXPLORATION.

As the job of deciphering progressed the pile of cards with lines which we understood typed out on them grew apace. Soon we knew how Zaitsman had joined the expedition, what had happened to Dr. Desnitsky and what the expedition had been doing in Yakutsk.

Came the day when we thought we had done all we could. To our regret, it wasn't very much, for quite a few pages appeared to have been lost. Others were so damaged that even with expert help we had only been able to restore individual words. Still others were full of Zaitsman's reflections which, unfortunately, had no direct bearing on the fate of the expedition and, though not without some interest in themselves, did not help us in the least—apart from giving us an insight into the author's character. From them Zaitsman emerged a typical representative of the old-regime liberal-minded intelligentsia, with a fondness for self-analysis and reflection, and a heightened sense of duty, conscience and the good of his country. He had managed to treat almost every single thing he touched upon in his notes from the angle of some moral problem. In this he had obviously also been guided by his aim: breaking something which was mysterious and—in his view—dreadful to his prospective reader. Still there was a certain sequence of events up to the expedition's arrival in the mouth of the Lena, where the diary broke off. Then came the entry made during Zaitsman's illness and deciphered with the aid of the chrono-scope. In addition, sewn into the first notebook there was a sheet of paper of a different quality, bearing entries different in subject and style, but in the same handwriting, that of Zaitsman. Now we were able to sum up all we knew. Zhiltsov and the other members of the expedition forgathered in Yakutsk in the autumn of 1914 when the First World War had already broken out. In back-of-beyond Yakutsk, of course, war was something very far away, but still the local authorities treated the expedition as an untimely nuisance, and if they did not actually hinder it, neither did they help in the least. It cost Zhiltsov and Cherkeshin no ordinary effort to build a small schooner and obtain the required equipment and stores. They were successful in the end, and, if we were to take Zaitsman's word for it, the credit was mostly Cherkeshin's. For some reason the author of the diary seemed to be very much interested in Cherkeshin, the captain of the schooner, and treated him as the central figure. Zhiltsov and Cherkeshin were helped a great deal by the political exiles of whom there were many in Yakutsk in those times. Learning about the proposed expedition, quite a few of them volunteered for work at the shipyard, and two of them—Rozanov and Zaitsman—even joined the expedition eventually.

Zhiltsov had obviously remembered the precedent of Toll's expedition where Katin-Yartsev, a political exile from Yakutsk, replaced Dr. Walter, who died in the spring of 1902, and two other exiles—Brusnev, an engineer, and Tsion-Glinsky, a student—were in the relief party led by Wollosovich. They must have made excellent stand-ins and Zhiltsov, we believed, readily supplemented his party by two upright and intelligent men. In his diary Zaitsman devoted a lot of space to himself and Rozanov. We learnt that Zaitsman, a medical undergraduate, had been exiled to Yakutsk for taking part in student disturbances and had been living there for several years. As far as we could see, he had no clear political views, but, being an honest man, he greatly resented the way of life in tsarist Russia and believed in freedom and equality and a happy future for all. Now Sergei Rozanov was of a different make. According to Zaitsman he was a member of the Russian Social-Democratic Labour Party, a professional revolutionary, a man of strong and clear-cut views on life. In his notes Zaitsman never entered into open dispute with Rozanov but took every opportunity to emphasise the man's single-mindedness and implacability. At first we could not understand the reason for this; then we thought he was more interested in Rozanov and Cherkeshin than in any of the others and took pleasure in drawing comparisons and contrasts between them. Possibly, this was only our imagination, for the notes broke off too soon. Rozanov, who was under strict police surveillance, joined the shipwrights building a schooner to be named *Zarya II* in memory of Toll's ship. For some reason Zaltsman never mentioned how Rozanov came to join the expedition. He himself was invited by Zhiltsov to replace the seriously ill Desnitsky and eagerly accepted the invitation.

The expedition sailed from Yakutsk in the spring of 1915 as soon as the Lena was clear of the ice. Not far from the river's mouth they took on board dogs and Yakut hunters who had been to the New Siberian Islands on previous occasions. Then the *Zarya II* passed through the Bikovsky Channel into the Laptev Sea.

That was all we were able to piece together. Our next step was to lock ourselves in Beryozkin's office and give the chrono-scope a new assignment. Looking forward to more thrills, we peered into the screen but this time the machine refused to illustrate Zaitsman's diary. To be exact, our window on the past did open a crack but not in the way we wanted it to. The entries we were chronoscoping referred to all sorts of events, while all we could see on the screen was a thin man who sat there writing away, his sharp shoulder-blades moving up and down. Hard as Beryozkin tried reprogramming the machine, tinkering with it, humouring it in this way or other—the picture was exactly the same. We kept at it unflaggingly from early morning till late in the afternoon, when finally Beryozkin threw up the sponge.

"Damn the machine," he said, slumping into his chair exhausted. "Still no ruddy good."

"There's no doubt in my mind that these are Zaitsman's notes and that Zaitsman was a member of the expedition," I said. "But they were never a diary. My guess is he wrote them from memory —in Krasnodar."

CHAPTER IV

IN WHICH OUR PLAN OF ACTION IS DISCUSSED, THE CHRONO-SCOPE SURPASSES ALL OUR EXPECTATIONS AND WE WITNESS EXCITING EVENTS WHICH PROMPT US TO QUICK AND RESOLUTE ACTION; WE HEAR FOR THE FIRST TIME ABOUT THE VALLEY OF THE FOUR CROSSES.

We gave ourselves two days off to catch up on other business and get some relaxation, but personally I got none, for my mind kept returning to the mysterious affair. When on the third day I let in my friend early in the morning his gloomy face at once told me that he had fared no better.

"What do we do next?" he asked. "I've had enough of this lolling about."

So had I. "Suppose we make inquiries in the Archives?" I said.

"I've been thinking about that too. They might have some document tucked away somewhere, mightn't they?"

Alas, we well knew it was just wishful thinking.

"Well, let's give it a try anyhow," I said, suppressing my strong doubts. "Can't do us any harm."

And so we returned right to where we had started.

"Of course we can always try the chrono-scope," I couldn't help saying somewhat ironically.

"Oh, yes, of course, and get an eyeful of Zaitsman's bony back," Beryozkin replied in the same tone.

We sent our inquiries to all archives in the name of the Academy's Presidium and turned again to the chrono-scope. Any port in storm, you know. Beryozkin had been intent on flying straight to Yakutsk but I talked him out of it. Not before we had received replies to our inquiries, I argued.

In the meantime, just to be doing something, we thought we might as well chrono-scope all the remaining pages—whatever the degree of legibility.

Looking through the first notebook we were struck again by the sewn-in sheet, so different from the other pages. All we had been able to make out at previous attempts was a row of figures looking like co-ordinates: 67° 21' 03" and 177° *y* 17". If these were really co-ordinates the place they denoted was in Chukotka, not far from where the Belaya River joins the Anadyr. Zaitsman could have got there if the *Zarya II* met her end off the Chukotka coast. But why did he have to give the place's bearings? And what on earth could be the meaning of what he had scribbled there besides: "Vly fr cr. (here followed the coordinates), n. hp., a. sh. vnts, dry hdn, cbn, NW, 140, rvr, grv., upr. pop., rts!!!"? It looked like a coded message to us and that was as far as we'd gone, for we'd done no chronoscoping on it, being quite certain to see Zaitsman's back again. Well, we were mistaken and our inexperience in the art of chronoscopy was our only excuse. We should have known better than put aside that sheet, which was so different from the rest.

This time Beryozkin suggested we start with it. First we programmed the machine to find how the sheet had been torn off. As soon as the chrono-scope was switched on Zaitsman's likeness was flashed on to the screen from the machine's memory cells; then for a long time nothing happened. The machine seemed to be taking its time about a new assignment. Then hands appeared in a close-up—thin, soil-stained; they opened a notebook, hesitated a moment, then hastily tore out the very page we were examining, folded it in four, and, as they stuffed it into an inside pocket, Zaitsman was shown in full again. Then the screen went dark.

"Two interesting details there," I observed. "Earth-soiled hands and hasty movements. Zaitsman was burying something and afraid people Would catch him at it."

"Let's chronoscope the scribbling," suggested Beryozkin. "Let's see what our apparatus will make of it."

No sooner had the task been formulated than the reply came. We saw a man, broad-shouldered, thickset, straight-backed, in fact as totally unlike Zaitsman as possible; his face appeared void of any individual features, and yet it impressed us as that of a man likely to be domineering and harsh, if not actually cruel; he was sitting and writing in a notebook exactly like the one we had just seen in Zaitsman’s hands. In the complete silence we heard strange words: "The end justifies the means. The decision is final, it only remains to carry it out. And it will be carried out, though I can foresee that not all will follow me...."

Beryozkin reached out 'and switched off the chrono-scope.

"Something's gone wrong," he explained. "We'll have to repeat it."

He repeated the task and the broad-shouldered harsh-faced individual appeared again. "The decision is final..." again we heard the chrono-scope's metallic voice.

"Well. I'm damned," said Beryozkin. "This beats me."

The metallic voice was saying: "...not all will follow me. But I will stand no nonsense...."

Suddenly the picture blurred and the words became incomprehensible.

Beryozkin disconnected the machine again. "Something is definitely wrong," he said. "Beats me though what could be. Nobody could have been tampering with it behind our back, could they?"

Beryozkin was quite put out. He was about to repeat the task all over again, when I asked him to take the sheet out of the machine.

"What do you want to do with it?" Beryozkin asked, not even caring to disguise his annoyance. "We've been all over it, inch by blessed inch."

But I got my way. I took my time studying the torn page, while Beryozkin fumed and fretted at my side, eager to be going on with it. He had had me nearly convinced when an interesting idea crossed my mind.

"Look," I said, "the machine scans the sheet from top to bottom, doesn't it?"

"Yes."

"Now look, Zaitsman's scribbling's almost as far down as the middle of the page—"

"But there's nothing higher up."

"Yes, there is. Something we can't see but the chrono-scope noticed...."

"You mean invisible ink?"

"I don't know but there is something. Try and specify the task. D'you think you can make the machine concentrate on the invisible text and just skip the rest?"

"I think I can, but are you sure it's worth the effort?"

"It may be."

"So you think it was an overlap, do you?"

He was quite a long time busying himself with the machine, while I was on tenterhooks waiting for him to finish; we were on a hot trail and I fervently hoped the chrono-scope would not let us down.

Finally Beryozkin sat down beside me and for the third time the broad-shouldered harsh-faced man appeared on the screen to the accompaniment of the same words. When the metallic voice said: "I will stand no nonsense," I involuntarily touched Beryozkin's hand but the voice went on undisturbed: "Whoever is against will sign his own death-warrant together with the riff-raff's. I notice some of them seem to forget who they all owe their lives to. I am going to refresh their memories. If only I can pull this off.... I'll never forgive Zhiltsov for taking that man on..."

The voice was silent; the image was gone.

We exchanged looks of smug satisfaction: the chrono-scope had cleared one more obstacle.

"So far so good, old chap, though for the life of me I can't see where that fellow comes in," said Beryozkin. "But never mind. Let the chrono-scope first read and illustrate for us what Zaitsman's got to say for himself."

What we saw and heard next was still more amazing. In its precise emotionless voice the machine announced: "The Valley of the Four Crosses." After this we expected to see the valley, but the machine seemed to be out of its depth, for after a fleeting image of something vague, Zaitsman appeared on the screen. Even as he began jotting something down in his notebook the voice said: "No hope. Am shaken by events. Diary hidden...." Then Zaitsman strode off in a straight line but we could not make out where he started from or where he was making for. The chrono-scope was silent while greenish waves sped across the screen, the whole giving an impression as if the electronic brain were tackling something for which it had not been equipped. Presently the metallic voice pronounced slowly, as though reluctantly, one word: "Cabin."

"Why, yes, of course!" I exclaimed, "that's what they call their huts up in the North."

But the chrono-scope apparently didn't "know" this, because no picture followed.

Beryozkin now fed in the meaning of the word "cabin", after which the picture of a small flat-roofed hut was flashed on the screen and Zaitsman began his march again—from the hut. "Northwest," the machine was saying, "one hundred and forty," while Zaitsman strode on. We realised that 140 stood for 140 paces. Then the voice said:

"River, grove." At that moment Zaitsman stopped and made another note. Jotting down the figure and the last two words, I thought. A vague picture of a river and then a wood appeared. After a pause the voice said: "Uprooted poplar, roots," and we saw a huge poplar lying on the ground.

"A lot of nonsense," Beryozkin gave his verdict. "The scene's inside the Arctic Circle, deep in the tundra, and here we are, being treated to Ukrainian poplar groves! We'll have to give it one more chance."

"No need to," I said. "The machine's done a marvellously accurate piece of restoration. We now know that Zaitsman hid his diary one hundred and forty paces to the north-west of a cabin, in a grove, under the roots of an upturned poplar!"

"But there are no groves or poplars up there! It's inside Chukotka, man."

"Oh, yes, there are. Any geographer will tell you there are pockets of wood in the valley of the Anadyr and some of the valleys of its tributaries. There is tundra all round the Anadyr basin but in its valleys there are full-scale woods of poplar, Korean willow, larch and birch. And this proves the chrono-scope's read and illustrated the notes correctly."

"It's fantastic," Beryozkin said musingly. "You know I sometimes feel there's no chrono-scope but we've just read or heard all this somewhere or thought it up ourselves.... It's time for quick action though. Danilevsky offered his help. Let's get him to charter us a plane and fly across to Chukotka. O.K.?"

"O.K."

Before flying to Chukotka, however, we sent the page we had chrono-scoped to the experts. After careful analysis they confirmed that apart from the visible writing 'there were very faint traces of another text: the preceding page had been written upon and the words got impressed on the one we had. So the machine's electronic "eyesight" had been keener than ours. The experts succeeded in restoring part of the text and the handwriting that emerged was hard and angular, quite unlike Zaitsman's. The page had been also checked for finger-prints; it was established that besides ours it bore the prints of two more people.

CHAPTER V

IN WHICH NEWS ARRIVES FROM IRKUTSK, WHERE THE FIRST EVER CHRONOSCOPY EXPEDITION STOPS OVER ON ITS WAY TO CHUKOTKA TO GET MORE INFORMATION ABOUT ROZANOV.

We reported the preliminary results of our work to Danilevsky, who in turn communicated them to the Presidium of the Academy. Our plans met with approval and soon the chronoscopy expedition had an airplane at its disposal. We could have set out there and then but had to postpone the start for close on a month because of the chrono-scope. Now, I don't remember mentioning earlier that the chrono-scope, despite its complexity and phenomenal sensitivity, was not very bulky. In designing it Beryozkin had aimed to make it portable. Of course none of us could carry it about, but it could be easily transported by plane or lorry. But for use outside the Computer Institute the machine needed some auxiliary equipment. It was installing the equipment in the plane that had caused all the delay.

As it turned out, however, we had no cause to regret it. First, summer had arrived. Second, we had received good news from Irkutsk. A worker of the Irkutsk Museum, an authority on Siberian lore, who had been consulted by the City Archives in connection with the Academy's inquiry about Zhiltsov's expedition, informed us in a private letter that though he knew nothing about the said expedition, the name of Rozanov was well known to him. If the Rozanov he knew—a Bolshevik who had fought for the Soviets against Kolchak—was the same man, we could get more information on him in Irkutsk.

That is why the expedition's airplane, with the chrono-scope mounted aboard, stopped over in Irkutsk.

The man from the Local Lore Museum met us at the airport. There was also a lorry laid on for us by the City Executive Committee: the good people must have thought we'd want to take the chrono-scope along. The man suggested we first go to see Rozanov, sounding as though he were still alive.

"Unfortunately not," he replied when I'd asked for confirmation. "But he's very much alive in the memories of the Siberians."

It was still very early, not yet 6 a.m., when our lorry passed through the quiet tree-lined streets and left the city behind. The highway curved towards the Angara and never left it. Thin clouds completely veiled the sky, while over the dark swift river white mist billowed and wreathed. It seemed to me the Angara was breathing, and her breath, cold and damp, reached us in the back of the lorry. I sat sandwiched between Beryozkin and our guide. None of us felt like talking. The lorry sped past birch woods with a sprinkling of pine in them, past villages stretched along the river, and I remembered that a new reservoir lake was soon to splash in their place. The mist was lifting, revealing the dark outlines of fishing boats on the river. The lorry ran through alternating currents of warm and cold air, but it was getting warmer; the sun was peeping out. Now we could easily see the holts on the left bank of the river and the narrow line of railway track hugging the very water's edge. Suddenly the river, and the road with it, made a hairpin bend and between two headlands we saw a pallid stretch of water— Lake Baikal.

We stopped at the village of Listvennichnoye and the man from the Museum led us up a steep hillside overgrown with pine and cedar. A well-trodden path brought us to a common grave topped by a tall white obelisk we had seen from afar. Among the many names on the marble plaque we found a name we knew: Sergei Rozanov.

"He was on the Irkutsk Communist Party Committee," said our guide, "one of the men who led the uprising against Kolchak. He was killed in January 1920, not far from Listvennichnoye, on the shore of Baikal."

We bared our heads; the morning breeze played gently with our hair. Baikal lay in front of us, half-concealed in a bluish haze, serene and enormous. A tugboat cast off and headed for the bluish line of horizon. And in the village on the shore, made up of sturdy, indestructible-looking log houses, tiny figures of children were moving along the long street on their way to school.

CHAPTER VI

IN WHICH THE EXPEDITION ARRIVES SAFELY IN CHUKOTKA, DISCOVERS THAT IN THE NORTH THERE ARE LOTS OF PLACE NAMES WITH THE WORD "CROSS", BUT, APPARENTLY, NO VALLEY OF THE FOUR CROSSES OF WHICH ANYBODY HAS EVER HEARD; THE VALLEY IS FOUND NONETHELESS.

In the City Archives we were shown documents which corroborated everything our guide had told us. Unfortunately they had nothing on Rozanov's earlier life. But at least the information they gave us helped to establish the reliability of Zaitsman's information. So Rozanov, in whatever manner he had joined the expedition, was really a professional revolutionary, a staunch Communist who had the courage of his convictions and met his end fighting for them against the Whiteguards. We had a clear picture of the man now, we'd come to respect and admire him, but we were still in the dark as regards the fate of the expedition.

True, we were no longer surprised by Zaitsman's turning up in Krasnodar, for he was not alone; Rozanov had reached habitable places too. But what had happened to the rest of them? Had they left any papers? And what was that mystery the dying Zaitsman tried to communicate? These questions were as unanswerable as ever. All our thoughts focused now on the Valley of the Four Crosses.

In three days, by an involved route, we reached Chukotka and touched down at the airfield in the village of Markovo. The locals were eager enough to help but none of them had ever heard of a Valley of the Four Crosses.

"There's the Gulf of the Gross," said the airfield chief, "and the Gross Pass. But no Valley of the Four Crosses—not to my knowledge."

"There's lots of 'crosses' on the Kolyma," the local agronomist remembered from his journeys. "Nizhniye Kresti, (*Krest*—the Russian for "cross".—*Tr.)* Kresti Kolymskiye...."

"No," we said. "Our valley's in the upper reaches of the Belaya River—and there's a log cabin in it."

"Some landmark," a man said. "Plenty of log cabins up here!"

"Yes, there are," we agreed. "But we've got the bearings. We know where to look for the place."

The next morning we began the search. The Polar Aviation plane we'd been given—we couldn't risk ours with the chrono-scope on board—took off and headed due north. At first we flew over the marshy Anadyr plain, criss-crossed by chains of small tundra lakes linked together by tiny creeks; then the country became higher and the plane flew across a narrow range of hills; from the distance the hills looked grey and bare, with occasional green patches of the creeping black alder. Beyond the hilly range lay a different country. Now the plane flew along the valley of the Belaya River. Constantly changing its course the river meandered unhurriedly between low banks skirted by the narrow arboreal belts with a thin piping of shrubbery; beyond stretched the tundra, drab, marshy, with grey blotches of snow in shady places.

The farther north we went, the higher were the hills round the Belaya River, the straighter the valley, the narrower the arboreal belts. Soon we had to climb higher, for the hills gave place to real mountains, also grey and also with green patches of alder; then there were fewer and fewer green patches, then none at all, but more and more blotches of snow; they lay in the valley and small rivulets ran from under them; trees now only occurred in small clumps that were becoming few and far between. In all this time I only sighted one reindeer-breeders' summer camp—a few peaked yarangs and a deer-pen—and one winter camp, which looked deserted, for not a plume of smoke rose over it.

The navigator told us that we were nearly there.

"Keep your eyes open, Comrade Verbinin," he advised. "You'll not find it easy spotting your crosses," and, as an afterthought, he added, "if any."

The valley was becoming narrower. Ahead of us, on the northern horizon, the towering peaks of the Anadyr mountain range were etched against the clear sky. But what really got me worried was the total absence of terrace woods: Zaitsman's coded message expressly mentioned a wood and an uprooted poplar, and their chrono-scope picture was still fresh in my memory. I sensed my friend's searching glance and looked round; his eyebrows shot up significantly as he pointed to the window. I understood that the sight was worrying him too.

I looked again and realised we were not going to find our valley in that area. Not because I suddenly had my doubts about the accuracy of our bearings, for we'd thought all along they were a rough approximation, but because of the geography of the area. As we progressed the floor of the valley had got higher and higher, so that now the northern winds had the freedom of the place. Poplars just couldn't survive here. From this I gradually came to the conclusion that our valley should be that of one of the Belaya's lesser tributaries, small, hemmed in on all or nearly all sides, well protected from the northern winds by the range, and sporting what well might be Kamchatka's northernmost pocket of wood.

Contrary to popular belief the undoing of arboreal vegetation in the North is not the intense cold. After all, Verkhoyansk and Oimyakon in Siberia, the reputed "coldest spots" of the Northern Hemisphere, with the lowest temperature recorded of almost —70°

Centigrade, are thickly-wooded and the trees show no signs of discomfiture. The tundra is treeless because of its 'low summer temperatures and the drying-up of the vegetation. Indeed in the North vegetation frequently succumbs to drought, standing "knee-high" in the water. Spring winds are particularly injurious:

the trees begin to come to life after their winter coma, the moisture evaporates but there's no feedback, for the soil is still frozen. And even when the soil has thawed trees can still die of drought because their roots will not take in cold water.

"We're there," said the navigator.

An arctic waste stretched below, with not a sign of life. I shared my idea with the navigator and asked him to bear to the east: as far as could be judged the Anadyr range should be more of a wind-break there.

The plane changed its course and climbed: we couldn't miss the green oasis of wood.

My hunch proved true in about twelve minutes, when from a high altitude we spotted a patch of green in the midst of grey mountain country. Losing height, the machine headed for it and circled over a small valley, dwarfed by the massive slope of the range. A narrow river with a scrap of wood alongside, the dark spot of a log cabin and the white patch of snow near it. But no crosses, until, at long last, we both sighted one—the largest of the four, we decided.

Nobody doubted we had struck *the* valley. Having got its bearings the navigator marked it on the map and we headed back to base.

CHAPTER VII

IN WHICH THE EXPEDITION ASKS FOR AND GETS A HELICOPTER, MOUNTS THE CHRONO-SCOPE ABOARD IT AND, AFTER A FORCED DELAY, SHIFTS BASE TO THE VALLEY OF THE FOUR CROSSES, WHERE INVESTIGATION IMMEDIATELY LEADS TO INTERESTING FINDS.

While we had looked for the crosses the airmen had looked for a landing-place and were now quite sure there were none fit to receive our chrono-scope-bearing plane. This was making our task more difficult. Our first plan was to parachute down, make a reconnaissance, then work our way on foot to the nearest settlement. But the airmen with whom we discussed it pooh-poohed the idea and suggested applying for a helicopter. Not at all sure of success, we radioed Anadyr and got a quick reply that a helicopter was being dispatched.

We spent a few more days remounting the chronoscope and equipment and were greatly relieved on testing the machine to find it in working order.

When all was set for the flight the rains began. Flabby grey clouds sagged landwards till they nearly reached ground level; visibility approached nil; all flights were stopped. What an utter misery it was to be grounded idle only a few hours away from our ultimate goal, bored to death and cursing our luck, and all the while watching rain ooze out of the clouds, the tundra marshes swell, little rivulets spread into rivers.... The nights were white and round the clock all was uniformly dull and murky. Even the local mosquitoes—big, hairy things—could not survive the boredom of it; at any rate there were none to be seen anywhere.

Then the weather cleared. We took off first thing the following morning and in due time sighted the green oasis.

The machine touched at some distance from the log cabin, just beyond the patch of snow. When the engine was cut and the rotor came to a stop after a final flip, the utter silence of the place surrounded us. Thrilled, we clambered out and looked around. Behind us, sheltering the tiny valley from the searing breath of the Arctic Ocean, reared the monolith of the Anadyr Range; the sky seemed to be resting on its serene, gently-rounded tops. Grey streams of loose shale ran downslope, petrified at our feet into tiny tongues, fluffy silver willows—so small two hands would adequately cover the biggest of them—carpeted the ground, the Lapland willow bloomed, the crowberry stretched its slender green-scaled twigs towards the gloomy sky, the weird, coral-shaped shrubs of the reindeer lichen stuck out here and there and further among the stones lay the wire coils of the stiff black alectoria lichen.

Our way to the log cabin took us across the snow patch. It looked like a pond suddenly frozen over, its waves, only a moment ago careening along, whipped by fresh wind, now dead and rigid.... A few susliks ventured out of their holes and whistled in alarm, seeing us.

The nameless tributary of the Belaya River which had its origin somewhere up the Anadyr Range was fairly wide, though not deep; a quantity of smooth-backed boulders showed above the water. The log cabin was on the left bank of the river while a poplar grove crowded its right bank.

It was near the log cabin that we saw the crosses: three of them tall and the fourth smallish, of the ordinary churchyard type. Two of the tall ones, standing somewhat apart from the rest, struck us as being very old. As we approached we saw that their black wood had been badly fissured by countless years of exposure and their bases whittled away by ground currents into a state of imminent collapse. No inscriptions could be seen on them—perhaps there had never been any. They towered there as a memorial to all those who had lived, struggled and died in the North.... They must have been erected by the first pioneers who, after paying this tribute to their fallen comrades, had pushed on to be lost in the arctic wastes, as though they had never existed, while the crosses remained standing, their arms spread protectively over the nameless graves.... Then—much later—two more crosses were added. One of them, the taller of the two, still bore the inscription:

Andrei Pavlovich Zhiltsov
Russian Polar Expedition
1914-1916

We had been 'looking into the fate of an expedition lost over two score years ago and had certainly never expected to find any of its members still alive. Yet when on the smaller cross we made out with difficulty the name of Mazurin, astronomer, we felt a sharp pang and our hands involuntarily went to our caps.

The old low-roofed cabin seemed to have sunk into the ground. To enter it we had to dig the doorway free; it was obvious the cabin had seen no visitors for a long, long time.

It was a gruesome picture that met our eye: on the floor piled high with torn and cut notebooks lay the remains of a man. We silently went out and, with relief, faced the coldish wind and listened to the murmuring of the river and the rustling of the poplar grove; the world around us looked wholesome and spacious, and it was with a new feeling that we now looked at the homely flowers of the Lapland willow, the scaly twigs of the crowberry, and the fluffy heads of cotton-grass nodding to us from where .it grew on waterlogged ground. After a long pause Beryozkin said:

"Zaitsman started counting the steps from here." His remark jerked 'us all back to reality. We re-entered the cabin and, avoiding as best we could the skeleton still covered in places with shreds of clothing, collected every scrap of paper there was and carried it all to the helicopter together with a badly-rusted hunting knife that the pilot had found near a wall.

CHAPTER VIII

IN WHICH TENTATIVE OPINIONS ABOUT THE DISCOVERED PAPERS ARE VOICED; BERYOZKIN AND MYSELF, GIVING IN TO THE CREW'S REQUESTS, SHOW THEM THE CHRONO-SCOPE IN ACTION; THE CHRONO-SCOPE, IN GIVING YET ANOTHER GOOD ACCOUNT OF ITSELF, MAKES US WITNESS TO EVENTS THAT HAPPENED OVER TWO SCORE YEARS AGO.

The pilot admitted that he had made the landing so far from the cabin for fear of damaging some material evidence, as he put it. Now that the reconnaissance had been made, we decided to move camp and chose a site on the edge of the poplar grove. Having pitched the tent and eaten a quick meal we settled down to putting some order .in the heap of papers, in which the crew gave us a most willing hand. The scraps of paper were faded and brittle and in perfect disorder, but all our hopes of success were now pinned on them and on the scrawls they carried. Like the majority of modern mankind who are taught to read and write in early childhood, we involuntarily placed greater trust in the written word. And even now, in possession of the world's first chrono-scope, a machine capable of more objective and precise reporting on the past than any chronicle, bound as it is to be coloured by the author's likes and dislikes—even now we waded straight into that heap of paper, forgetting all about the miracle machine. This rashness was to cost us many hours of futile conjecture.

The pilot and navigator, delighted at being allowed to help and each no doubt fancying himself a Sherlock Holmes, took only time off to refer to "the bastard"—as the navigator called him—who had slashed the diaries and scattered them all over the place.

"Whatever brought the goon here?" said the pilot. "Fancy—in a place where even the Ghukchis never graze their reindeer!"

"Nothing brought him here," said Beryozkin. "My guess is it all happened back in sixteen and is the very same tragic incident Zaitsman was trying to communicate when he was at the point of death. One of them went mad and they had to—"

Beryozkin left the sentence unfinished but we understood. Indeed the disorder in the cabin was such as could only have been produced by one demented.

"After the hell they'd been through," said the navigator, "anything's possible."

And he stopped referring to "the bastard".

Working with old, crumbling manuscripts, however, requires not only ready will but a good deal of experience, of which I happened to have considerably more than Beryozkin and our two willing helpers combined. So, gradually, I made them drop out and sit idle, and being idle, as you will appreciate, is a dull occupation. Perhaps for this reason the thoughts of our two helpers began to wander and, finally, came to the helicopter and, then, to the chrono-scope mounted in it. Then came a polite reminder of the promise we'd made to show them the machine in action as soon' as we arrived.

"I say," the navigator said, gingerly picking up the rusty hunting knife off the ground-sheet;

"S'pposing you ventilate this here object."

Beryozkin's sympathies, for all his respect for the written word, belonged to the chrono-scope and he easily gave in, no doubt spurred on by a desire to show off his brain child.

"Give us a page or two," he asked me. "I'll show the chaps a bit of chronoscopy."

I didn't like the idea, frankly: papers should not be touched until they're in perfect order; so I tried to stall, muttering I might need any one of them any moment at this stage....

The navigator brandished the knife.

"But what about this?"

And Beryozkin fell for it: before we had chronoscoped nothing but manuscripts and here was a chance to try a different material.

"Come on," he told them. "We'll leave Verbinin to it."

I was particularly interested in Zhiltsov’s diaries, parts of which I discovered after a great deal of sorting out. They were badly damaged, which made me again curse the maniac responsible, but still I was soon making fairly good progress and beginning to hope to be through with the preliminary work in a couple of days.

It was night by my watch but I went on working, happy that Chukotka was in the polar day season just then and what little darkness there was arrived not before midnight. Indeed I was so absorbed by my work that when Beryozkin's shouts came I didn't hear them—they just didn't register.

Beryozkin, with the pilot on his heels, tore into the tent.

"Are you asleep or what?" Beryozkin shouted impatiently. "Didn't you hear us yelling? Come on, quick! Astonishing results!"

In his impatience he tried to drag me outside, but I had covered the papers carefully before letting him do it.

"What's it all about?"

Never stopping to reply, they dragged me to the helicopter where the navigator, who had just jumped out of the machine, shouted to me with his usual impulsiveness:

"That knife's got rusty with blood!" and, after a deep breath, he added softly, "Suicide." Then in a different, admiring tone he said, "Terrific machine! Absolutely first-rate!"

"Was it really ... suicide?" I asked, stopping.

"Yes. I chrono-scoped it three times," said Beryozkin. "Same results."

"Who does the man look like?"

"The image is rather vague—unfortunately. Doesn't look like Zaitsman or that hard faced fellow though...."

"Zaitsman! Zaitsman died in Krasnodar."

Beryozkin made a wry face.

"As though I could have forgotten that! I only meant the screen showed a generalised image."

"Seems as though Zaitsman had really grounds for tormenting himself with his right-or-wrong questions?"

"I don't know," said Beryozkin. "It's all rather vague. And I'm not at all sure when it all happened either."

Presently the episode which had been stored in the machine's memory was played back for my benefit, producing such a weird and painful impression on me that I am really reluctant to recall it in detail now. Suffice it to say that, according to the chrono-scope, the man had committed suicide in a state of frenzied fury. We couldn't help thinking it must be the same man who had damaged the expedition's diaries. I agreed to have a few of the worst-damaged pages chrono-scoped and the machine bore us out on that; the screen showed a man in a murderous rage wantonly cutting, tearing and throwing about sheets of paper. He was armed with a hunting knife, the one we had just seen him put an end to himself with.

However, there was nothing in the screen to throw light on what had caused that fit of frenzy, what the others had done about it, or, if the man was alone, what had happened to the others; finally, we could not understand why he seemed so set on destroying the documents about the expedition. As I watched the man rush about on the screen, it occurred to me his was a rage born not of strength and conviction, but rather of desperation. At least so it seemed to me at the time.

On the request of the crew we showed them all that the machine's memory contained in connection with the expedition and then summed up all we knew. This is what it all came to:

1. In Yakutsk two political exiles, Rozanov and Zaitsman, joined Zhiltsov's expedition.

2. The expedition set sail and two years later some of its members visited a log cabin in the Valley of the Four Crosses, where two of them, Zhiltsov and Mazurin, died.

3. For some unknown reason the explorers left the documents about the expedition behind in the log cabin when they went away, and a man, presumably a member of the expedition, tried to destroy them before committing suicide.

4. Zaitsman reached Krasnodar, where he died of typhus. Before death he was tormented by pangs of

conscience, trying to make up his mind whether they had been right or wrong in doing something, and in his diary he seemed to oppose the political exile Rozanov and the ship's captain Cherkeshin.

5. Rozanov died fighting Kolchak, and was buried in a common grave on the shore of Baikal.

CHAPTER IX

WHICH DESCRIBES THE FIRST STAGE OF THE EXPEDITION'S WORK ON THE BASIS OF ZHILTSOV'S DIARIES, NOTES THE SUBTLE AND DETAILED CHARACTERISTICS OF ITS MEMBERS AND CONTAINS CERTAIN REFLECTIONS ABOUT HISTORY REPEATING ITSELF.

We read all that was left of Zhiltsov's diaries with no particular difficulty, rarely needing to use the chrono-scope. They were characterised by a lucid and balanced style, by goodwill towards the other men and almost complete absence of information about the author. That immediately won us over, and, reading Zhiltsov's diaries, we tended to trust his every word. The diaries of the other members of the expedition, which we read later, completed for us the picture of Zhiltsov. He belonged to that splendid school of Russian naval officers, scholars and humanitarians, men of enlarged views, clear-sighted and strong-willed, of which Krusenstern, Lisyansky, Lazarev, Bellingshausen, Kotzebue, Nakhimov, Makarov and Sedov are the more outstanding representatives. His diaries offered no statement of faith, but their general trend, plus the occasional glimpses of his likes and hates they contained, led us to believe that though no revolutionary he was undoubtedly a progressively-minded scientist. His attitude to Rozanov and Cherkeshin furnished additional proof. This triangle of men of different views and personalities became apparent as soon as the expedition left Yakutsk.

A few pages in the diaries somehow stood out from the rest. We called them "defensive", which is perhaps not exactly correct. When the Zarya II was already out of Yakutsk and sailing down the Lena, Zhiltsov wrote in his diary in some detail that he considered the schooner's crew was under strength and one more deck-hand should be signed on somewhere on the way. Indeed a page further we found the laconic entry that S.S. Rozanov had been-taken aboard as a deck-hand. We thought that odd, Zhiltsov recruiting Sailors, because normally it's a captain's job. However, like the fair-minded man he was, Zhiltsov recorded immediately below that Lieut. Cherkeshin had strongly protested against another political exile being taken on board, but that he, Zhiltsov, had overruled that protest.

This episode helped to clarify another point for us. We were already aware that Rozanov, 'like Zaitsman, had worked as a shipwright in Yakutsk. So if he hadn't joined the expedition there, it was because something had prevented him. We believed now that being, unlike Zaitsman, under strict police surveillance, he had been refused permission to join: the expedition was to sail too close to the American coast. But apparently he had set his mind on going, and Zhiltsov, though obviously aware of the authorities' stand, sympathised with the man enough to take him on on the way, despite Cherkeshin's protest.

On passing from the mouth of the Lena into the Laptev Sea the *Zarya II* headed straight for the New Siberian Islands. The sea was already clear of ice, save for occasional weather-eroded floes which easily shattered under the schooner's bows. After a few days' sailing the *Zarya II* approached Vasilyevsky Island, which lay on the route to the New Siberian Islands. This island was discovered as far back as 1815 by a Yakut, Maxim Lyakhov, who lost his way going across the ice from the mouth of the Lena to Kotelny

Island. Apparently Zhiltsov didn't know that in 1912 a Russian hydrographical expedition on the ships *Taimyr* and *Vaigach* had visited the island and made a thorough survey of it. He gave a detailed description of the island in his diary, stating that it was rather small and low-lying and formed of layers of sand and clay and fossil ice, and being steadily frittered away by the sea. Then the *Zarya II* pushed on, towards Kotelny Island, and, taking advantage of the favourable ice conditions, attempted to work her way round the New Siberian Islands from the north. She proved successful where others had failed and penetrated farther north than any ship before. But one day Zhiltsov noticed on the clouds the typical reflection of ice ahead and, indeed, the next day formidable pack ice barred their way. For some time the ship tacked close to the pack's edge, hoping to find leads in the ice, but in the end was forced back and headed for Bennett Island, which was discovered back in the last century by De Long and later served as the last abode for Toll's party.

The *Zarya II* had visited the places where Sannikov Land was supposed to be and found nothing.

There are a few pages in Zhiltsov's diaries about this, very remarkable pages. Although he cited all the arguments against its existence he nonetheless believed the people who had seen Sannikov Land and for this reason considered that the question was still open. It gave us real pleasure to read an entry in his diary where he stated that he had no more reason to suspect dishonesty in Sannikov, the unlikeliest man to fraud a discovery, than to question Toll's integrity as a scholar. They, like so many other arctic explorers, recorded What they observed and never committed to paper what they didn't; that is what he said, almost word for word.

Beryozkin and myself were greatly interested in the little character sketches the diaries contained; generous, well-intentioned and patently impartial, they gave us an insight into the relationships on board the *Zarya II* and helped us later to find the cause of the tragic events that happened in the Valley of the Four Crosses.

Cherkeshin, the ship's captain, was an experienced sailor and an arctic veteran, a man of intelligence 'and initiative, but, as Zhiltsov noted with a certain apprehension, an arrogant martinet, a believer in harsh measures, no friend of his subordinates or the Yakuts.

Mazurin, an excellent astronomer, on the contrary was a mild and easily-influenced man. This was his first polar expedition.

Konoplyov, the ethnographer and zoologist, a very keen worker, a good brain and a warm heart, treated all men as good friends and brothers, but was apt, as Zhiltsov added, to be rather sharp when speaking to the captain.

Zaitsman's characteristic tallied with the opinion we had formed after studying his diary; Zhiltsov called him the expedition's "conscience".

Govorov, the first mate, was young, upright and keen on his duties, but had little experience.

It was a pity Zhiltsov had nothing to say about the crew. Nor did he say anything about Rozanov, whose name, however, cropped up later in the diaries.

Soon after the schooner entered the Arctic Ocean Lieutenant Cherkeshin began work on his far-reaching plan. At first things looked normal enough: the captain insisted on strict discipline and punished those responsible for every fault, however small. The crew—and the expedition personnel—worked with a will, but Cherkeshin was not to be satisfied. He insisted on barracks discipline and blind obedience, and this, coupled with his blatant contempt for the inferiors, led to tension.... It is difficult to predict what the outcome would have been, had the political exile Rozanov not been aboard. He soon had the crew's confidence and when Cherkeshin attempted to introduce corporal punishment he led the crew against the captain.

Rozanov called on Zhiltsov as their Spokesman and presented their demands. Zhiltsov was neither surprised nor outraged: it appeared he had seen through Cherkeshin's design and was not unwilling to bring the matter to a head so as to put an end to it all the quicker. He had known for some time that Cherkeshin, using his authority as captain, wanted to elbow him out of leadership and realised that intimidating the crew—his possible allies—was part of the campaign.

But he wouldn't be caught napping, for he knew the signs: it wasn't the first bid for power over an expedition he had seen in his life.

In 1902 the *Zarya's* captain, Lieutenant Kolomeitsev, attempted the same. They were off the Taimyr coast at the time and Toll, displaying energy and courage, deposed the over-ambitious captain and dispatched him with the mail to the Gulf of Yenisei, entrusting Matisen with his job.

That is how Rozanov and Zhiltsov had become allies. They didn't have to wait for long: a reckless man, Cherkeshin went too far too soon and had both the crew and the members of the expedition against him. His bid for supremacy flopped. Unfortunately with the ship on the high seas, Zhiltsov could not get rid of Cherkeshin. Then the captain admitted his incorrect behaviour and Zhiltsov wrote in his diary that having realised his mistake Cherkeshin would probably not repeat it.

These events also helped us to understand the conflict between Zhiltsov and Cherkeshin over Rozanov; Zhiltsov, foreseeing trouble with Cherkeshin, needed Rozanov as a man with enough grit to stand up to him; while Cherkeshin, bent on the take-over, had a feeling this man might be in his way. It is a credit to the intelligence of both that their conjectures proved to be right.

Soon after these events a reflection of open water was reported on the clouds ahead to the north. Cherkeshin suggested pushing through to the *polynia.* (*Polynias* are patches of unfrozen water amid icees.—*Tr.)* Zhiltsov agreed and the schooner entered the pack and started on her tortuous way. Suddenly the wind changed, the leads widened and the schooner was steaming ahead, when the wind changed again and the floes began to close in.... There was a brief note in Zhiltsov's diary: "Cherkeshin is the hero of the day; only his skill has saved the expedition a lot of trouble."

As the arctic summer was running out the schooner reached Bennett Island, the largest in the De Long Archipelago, mountainous and uninhabited. Thirteen years before. Toll, having waited in vain for the arrival of his schooner, left the island and started on his last trek across the treacherous November ice. The *Zarya* rotted now, beached in the Tiksi Bay, while her successor— the *Zarya II*—with men aboard eager to take over where Toll had left off, was heaving to off that rocky island.

A party led by Zhiltsov rowed ashore and, splitting in two, began a survey of the island. Konoplyov, Zaitsman and Mazurin went off together, while Zhiltsov took with him Rozanov and two Yakuts, Lyapunov and Mikhailov, to look for the hut built by Toll's party.

The sky had darkened by degrees and it was not until a sudden squall 'lashed his face that Zhiltsov realised that a storm was coming and they ought to hurry back. They turned and headed straight for the landing-spot—Zhiltsov in the lead. They were traversing a small glacier which drained into the sea at a steep angle when a vicious gust of wind flung Zhiltsov down on the ice. His fatal rolling was stopped by a crevasse. It was rather shallow as Rozanov and the Yakuts found when they reached it. Zhiltsov lay motionless on its floor, not answering their shouts. The wind was increasing and it was all they could do to keep from rolling over the edge when they started the rescue operation. Rozanov and Lyapunov lowered the small lithe Mikhailov on a rope down to Zhiltsov. He was alive but too badly hurt to move. Straining every muscle they rescued their leader and between them carried him to where they expected to find the boat. They found it—as well as the other party—but the *Zarya II* was gone: she could not stay close to the rocky shore during a storm.

After a few hours drift-ice appeared. The wind was as strong as ever but the violence of the waves had abated. Nobody was cheered, however, for the ice kept creeping in from the north, building up a barrier between the island and the schooner which was riding it out in the open sea. The men on the island knew they had not a chance in the world if the *Zarya II* did not get through to them. Toll's party had had warm clothing and food and no invalids, and yet they had all perished. While all *they* had was a small tent in which they now sat round Zhiltsov—thinking whether Cherkeshin would break through or retreat like Matisen had done.

By the fourth day the island was completely icebound and even the horizon showed no reflection of open water anywhere round. Nor was Zhiltsov any better. Zaitsman assured him that his injuries were not fatal but he himself was thinking of suicide, persuaded that this would add to the chances of the others.

After two weeks they were all in a pretty poor shape when a successful reindeer hunt by the Yakuts brought fresh hope. Then they sighted a faint smoke on the horizon: that was the *Zarya II* battling through to the island. Cherkeshin had not let them down. As the schooner couldn't possibly get close inshore they walked across ice to meet her. They were met halfway by their comrades and soon the expedition was in full strength, back on board the schooner. Cherkeshin, haggard-faced, handed over to the first mate and, not listening to the words of gratitude, went below to catch on badly-needed sleep.

"We all owe Cherkeshin our lives—particularly myself," Zhiltsov, now on the way to recovery, wrote in his diary.

CHAPTER X

IN WHICH ARGUMENTS (OR AND AGAINST SANNIKOV LAND ARE BANDIED, THE NOTEBOOK HIDDEN BY ZAITSMAN IS UNEARTHED AND MORE ABOUT ZHILTSOV'S EXPEDITION IS DISCOVERED.

The weather was changing for the worse. Dry flakes drummed on the taut side of the tent. Outside, the susliks had stopped their whistling, snug in their burrows. Low, flaky clouds sped southwards. A large polar sea-gull appeared from nowhere, circled over the valley, mourning with a plaintive cry the absence of a sea or lake in the vicinity, then soared high and winged away to the south-east. We, too, could have soared high and flown away to the south-east, to Markovo, but we did not. Beryozkin and I thought we ought to do some more on-the-spot chronoscopy and altogether felt we had made too little and inexpert use of it. The crew felt differently, overwhelmingly impressed as they were by the rusty knife test. But we were sceptical over that, too.

"Incidentally there's no proof yet that the machine was right in that case," Beryozkin challenged them.

This brought vigorous protests, which only caused the inventor to start listing in tedious detail all the chrono-scope's real and imaginary faults.

I was annoyed at first but then it dawned on me Beryozkin was just tired. The same as I was. For several months we had been following up the expedition, talking of the expedition, thinking of the expedition, day and night. And now that the solution was just round the corner, the strain began to tell. What we really ought to do was forget it all and relax and talk about something quite different, or else go shooting in the mountains. But we just couldn't talk about anything else, and to go shooting would mean disturbing the peace of the very places through which Zhiltsov's expedition had tramped two score years back....

I stepped out of the tent. The furious gusty wind threw hard snow into my face. The poplars groaned under the impact of the gusts, their tops bending down resiliently, each leaf straining to tear off and fly away, but few of them actually succeeding and even those dropping not far away, in the river or on the dry screes where hard flakes of snow were gathering in small drifts. A stray lemming, tiny and brownish, dashed squeaking between my feet and disappeared into a hole. Suddenly I remembered about Zaitsman's notebook which we had completely forgotten in the excitement of the log cabin discoveries. Why should he want to hide it, I thought, when the others all left their diaries in the cabin? I crossed 'the river to the log cabin, faced to the north-west and, counting my steps, strode into the teeth of the wind. Recrossing the river I entered the poplar wood and on the count one hundred and forty drew level with what was still easily recognizable as a mighty uprooted poplar; wood rots slowly in the North. I stood there, then went back to fetch a spade.

In the tent they were talking about Sannikov Land. The navigator, young in years and new to the North, had ventured the opinion that Zhiltsov's expedition had found Sannikov Land after all. He so wished it were true! Beryozkin and the pilot tried to laugh him out of it, but he stuck to his guns.

"Why," he was saying as I entered the tent, " half a century ago Zhiltsov believed in people, in their good faith, while you—" and he broke off, choked by the contempt he felt for them.

"Well, ask Verbinin if you don't believe us," Beryozkin said, somewhat hurt. "If it existed it would have been found long ago. Ice-breakers and aircraft have been all over those places—many times. Why, man, it's been specially searched for."

"So Sannikov and all the rest of "em just lied, did they?"

"Made a mistake," said the pilot. "That's alt,

It's happened before in the Arctic." The navigator looked at me appealingly,

"I, too, believe everybody who said he'd seen Sannikov Land," I said. "All of them—Sannikov, and Jergeli, and Toll.

"Think for yourself, why should Sannikov lie? To curry the tsar's favour? Not him. He didn't even report his discoveries to St. Petersburg as that enterprising merchant Ivan Lyakhov did. For which Catherine the Second granted him the honour of naming two islands after him—the Maly and the Bolshoi Lyakhov Islands—together with exclusive rights in mammoth tusks. Or take Jergeli. His wish to get to Sannikov Land was so great that he told Toll he would gladly give his life to be able once to set foot on its soil. No, those were not people likely to lie."

"Sounds nice but hardly convincing," Beryozkin said pointedly. "Whatever you say, you can't see things that don't exist."

"A mirage," said the pilot.

"It was no mirage," I said. "Whether Sannikov Land existed or not, it still could have been seen."

The pilot's answer to this was a snort and even my ally, the navigator, could not help smiling.

"There are two tentative explanations to the Sannikov Land mystery. You remember Zhiltsov mentions Vasilyevsky Island in his diaries?"

"Yes," said the pilot.

"Do you believe that he actually saw it?"

"Of course he did!"

"And yet there's no Vasilyevsky Island—there or anywhere."

"How's that?"

"It just doesn't exist, that's all. Not a single map shows it."

"But surely Zhiltsov couldn't have lied, could he?"

"You think Sannikov could?" the navigator cut in triumphantly.

"The island was reported by the Yakut Mikhail Lyakhov and by the Russian hydrographical expedition on the *Taimyr* and the *Vaigach,* and later seen by Zhiltsov and his people. But the Soviet ship *Chronometer* sent to the island in 1936 for detailed surveying never found it. The island had melted away. In its place they found a sandbank in eight feet of water. And later, in the forties, Semyonovsky Island disappeared in the same way."

"Melted away?" the pilot repeated dubiously.

"You forget that it was built of fossil ice and layers of clay and sand. The Arctic is in the warm spell now, ancient ice melts and whole islands disappear. Well, that's the first explanation of Sannikov Land. And surveys of sea-floor to the north of the New Siberian Islands seem to bear it out."

"What about the second explanation?" asked the navigator.

"It is this. A decade or more ago gigantic icebergs were first discovered in the Arctic Ocean. They drift in ellipses and occasionally appear near the New Siberian Islands."

"But which is the right explanation?" "Both might be. A small island or islands might well have existed to the north of the New Siberian Islands and then melted away. However all who saw Sannikov Land claimed it was mountainous. So I'm inclined to believe it was icebergs they saw—here today and gone tomorrow."

"So Zhiltsov never discovered it," said the navigator and sighed; he didn't like my explanation. "Alas."

I picked up the spade and moved to go. "Where are you going?" asked Beryozkin. "To dig out Zaitsman's notebook." They all filed out after me, but when we reached the half-rotten tree the crew moved to the fore, eager for action, leaving Beryozkin and myself only the task of directing them. While the pilot was carefully removing the turf and the navigator badgering him for a turn with the spade, I wondered whether the notebook was still there and if it was, in what condition. I had reasons to feel apprehensive too. As is well known, the ground in the whole of Northern Siberia is bound by permafrost, in some places to a depth of several hundred yards. In the brief polar summer only the uppermost layer, the so-called "active layer", comes to life and that is only two feet deep, or six in the valleys of big rivers. This layer is very "active" indeed: it thaws in the summer and gets waterlogged, then in the autumn it freezes from the surface downwards, and the liquid subsoil, compressed by the layer of ice, breaks through and bursts •out. I was pretty certain that Zaitsman had buried his notebook within the active layer; even if it was well packed we had next to no hope of finding it in good condition.

I should have preferred my reasoning to prove incorrect: we found the packet but it was in very poor condition. We carried it carefully to the tent and spread out its contents, for what they were worth, to dry.

The next day I went back to Zhiltsov's diaries. His expedition's fate has been the same as that of many another. In the East Siberian Sea the *Zarya II* entered heavy drift-ice, which suddenly, in a matter of a few hours, froze solid. The schooner was icebound and no attempt to break through brought success. A slow drift in an easterly direction began. Then the polar night descended.... It could be gathered from Zhiltsov's diaries that the expedition was well supplied with food, but by mid winter most of the men were showing signs of scurvy. In those days vitamins were virtually not known.

Zhiltsov, still the worse for his fall, was the severest case of scurvy aboard. He stubbornly fought the disease, staying out of doors as much as possible, taking exercise, joining in the unsuccessful seal shoots. Added to scurvy he developed some other illness nobody could diagnose. The last entry in his diary which he dictated was addressed to the Academy of Sciences, followed by a few words of love to his family—words that never reached them.... Zhiltsov knew he was dying; he retained a clear mind and strong will till the last moment. All the other members of the expedition whose diaries we read later agreed in this. All paid their homage to the dying leader, thinking with apprehension of the uncertain future that would face them when he was gone. A day before he died, Zhiltsov summoned the members of the expedition and the captain to his cabin. As he took leave of them he said he was handing his duties over to Lieutenant Cherkeshin.

"He's the man with the most experience," he explained. "He will see the expedition's work is completed."

Zhiltsov's hand stirred and Cherkeshin, guessing his wish, took the dying man's hand and pressed it lightly.

"The expedition's work will be completed," said Cherkeshin. "I promise you."

Zhiltsov was buried among the ice-hummocks not far from the schooner—not in the Valley of the Four Crosses, as we had thought.

A month later the boatswain died. All the diaries broke off on that tragic note, save for brief entries after a week and a half or so, recording the loss of the schooner, which was crushed by the ice off the coast of Chukotka.

CHAPTER XI

IN WHICH HUMAN BRAIN ACCOMPLISHES WHAT NO "ELECTRONIC BRAIN" COULD EVER DO, THE CHRONO-SCOPE RENDERS US ITS LAST SERVICE, WHILE WE, AFTER A FINAL SUMMING-UP, FLY BACK TO MARKOVO.

We had guessed before that the schooner had been lost because the expedition would hardly have abandoned her of their own accord. Just as we had guessed that, those alive had marched southwards, struck the continent, crossed the Anadyr Range and reached the Valley of the Four Crosses. What we still did not know was the explanation of the I events in that valley, or why Zaitsman kept tormenting himself—till his very death—with the question whether they had been right or wrong. In this the chrono-scope was helpless, nor had the diaries anything to suggest: the men, weary with fighting for their very lives, had no inclination for psycho-analysis....

"You're the only hope that's left us, old man," Beryozkin told me.

"Me?"

"Yes, you. You remember you once told me the difference between the investigator's method of work and the writer's. Something like 'the investigator proceeds from events to characters, while the writer follows the reverse order."

We did have a talk once on this subject, I remembered, though in what connection, escaped me. At the time I had voiced the opinion that the creative process breaks up in two stages. The writer is supreme while he is still endowing his cast with traits of character and facing them with circumstances. But as soon as characters have taken shape and circumstances been faced the writer turns observer, as it were: his cast begin acting independently of him, in accordance with their inner motives; in the writer's imagination they are alive and sovereign. I've been long convinced that literary characters behave in the author's imagination exactly as flesh-and-blood people with similar motives will, when faced with similar circumstances. I mean of course the inner logic of their behaviour, which is their prime mover, after all.

"What are you driving at?" I asked Beryozkin, though I had a shrewd suspicion what it was.

"Start that old creative process of yours, will you," he said. "We know the characters and we know the circumstances. You must try and guess what they did under them. This is a case where no electronic brain can take over from the human.... You remember you claimed on the Sayan Ridge that the human brain is the best chrono-scope?"

I said I remembered but remonstrated that the creative process requires inspiration, a certain emotional tuning.

"Well, tune in," Beryozkin demanded with a grin.

A careful analysis of all we knew soon convinced me that the task was not as hard as it seemed at first. It was all adding up into a very likely explanation of the events that followed the loss of the schooner and led to Cherkeshin's banishment. That he had really been banished we learnt from a short note found among the papers, which also gave the motives.

The following is, for what it's worth, my reconstruction of the events.

Crushed by the ice, the schooner went down. The small group of men watched her go, stunned, In face of the enormity of what had happened they momentarily lost their head. And no wonder: neither the expedition members, nor deck-hand Rozanov had any previous experience of travelling across sea-ice. And no aid could be expected from anywhere. Only Cherkeshin, the man with most experience among them, saw his way ahead; he felt he was the principal character now, the man on whom the lives of the others depended, and that, added to his pride and ambition, bolstered up his own courage. I am sure it was Cherkeshin who found words of encouragement at that moment, who restored hope and fight in the shipwrecked men. And he led them to the distant coast of Chukotka. The men followed him and Cherkeshin grew more and more conscious of his importance and power—tending to forget that discipline was not servility, that only team-work could bring deliverance; everything they achieved he ascribed to himself, which only added to his contempt for them.... Then a new element appeared: while becoming affable to the expedition's personnel and his Chief Officer, he grew still more cavilling with the crew and the Yakuts, abusing and even striking them. Rozanov of course could not let that go unchallenged. But this time he was not supported. The divide-and-rule principle had borne its hateful fruit. The men who had basked in Cherkeshin's favour—Mazurin and Zaitsman among them—kept silence, while the downtrodden, travel-weary crew and Yakuts had no fight left in them. Cherkeshin lost no time in profiting from the situation, considerably adding to their packs and chores. Rozanov saw through Cherkeshin's design of saving some at the expense of others, or, actually, saving himself, for well aware that alone he had no chance of survival, he was ready to sacrifice the crewmen and Yakuts to let the rest last longer. He was particularly harsh towards the Yakuts and that at last gave Rozanov his first reliable ally, the ethnographer Konoplyov. So when once on a march Cherkeshin tried to kick the overburdened Yakuts into a quicker pace, Rozanov and Konoplyov stood up for them. Zaitsman and Mazurin sympathised but hesitated to speak against a man who had saved the lives of all, while Govorov did his best to smooth the conflict over.

But nothing could smooth it over. For the small group of men lost on the ocean of ice was torn, in its small way, by the very same contradictions that were tearing apart their vast revolution-ripe country. Here, too, some were bent on exploiting the others, using both class and racial prejudices. Here, too, protest was ripe. The inequality fostered by Cherkeshin was becoming too irksome. Yet after they had finally struck the continent he was more hell-bent on it than ever.

Exhausted and hungry, in the severest winter conditions, they crossed the Anadyr Range and came down into a small valley where they found an empty log cabin and two tall crosses that had stood there for innumerable years. The sight of those two crosses must have affected them a great deal, for their strength was running out as well as their food and their chances looked very slim indeed.

Cherkeshin decided they would have a short rest in the log cabin. The very first days were beclouded by the death of Mazurin. He had seemed no weaker than the rest, but one morning he did not wake up. They buried him near the two did crosses and it was then that Rozanov built a cross in tragic memory of Andrei Zhiltsov's polar expedition.

Mazurin's death seemed to have goaded Cherkeshin into action. Two days later he accused the Yakuts Lyapunov and Mikhailov and deck-hand Rozanov of stealing food and demanded their banishment without rations. That meant sending the men to sure death, but Cherkeshin was prepared to sacrifice them for his own survival. And then happened a thing Cherkeshin had never anticipated, blinded as he was by his hatred and contempt for them all: they rose against him in a body again. Quite easily they established that Cherkeshin himself had hidden the food. The man reached for his revolver but was overpowered and tied up before he could use it.

The court of honour sat the same day. Rozanov proposed giving Cherkeshin an equal share of rations and sending him away. Only Zaitsman opposed this. He reminded them of Cherkeshin’s services to the expedition, of how he had broken through to Bennett Island, how he led them across the ice to the continent, but Konoplyov and the others were adamant.

In Cherkeshin's presence all the food was divided in equal shares and one given to him. Zaitsman again started appealing to their sense of justice until Rozanov suggested he should go with Cherkeshin. This silenced him. The following day Cherkeshin left the valley.

The chances of the rest were not much better. So Rozanov proposed leaving most of their diaries in the log cabin on the off-chance of somebody finding them and forwarding them to St. Petersburg. They did as he said and went away, and we don't know to this day what happened to them, except for Rozanov and Zaitsman.

As for Cherkeshin, he returned to the log cabin. He had failed in the most searching test of courage—that of solitude. He came back broken, most likely, to say he had been wrong, but found nobody and in a fit of impotent rage slashed and scattered the diaries. The sequel we knew from the chrono-scope.

Such was my reconstruction of the events.

Before flying back to Markovo we decided, without much hope, to chrono-scope the now dry notebook that Zaitsman had once hidden. For a long time the machine showed nothing despite all Beryozkin's efforts. Then a fuzzy figure appeared, in which we thought we recognised the harsh-faced man that we had seen before on the screen.

"Is that really him?" asked Beryozkin.

"I think it is."

After more manipulation with the controls the image became slightly clearer.

"It's Cherkeshin," said Beryozkin. "Ten to one it's him. So Zaitsman hid a notebook which wasn't his. You remember 'the end justifies the means, I will stand no nonsense' and all the rest of it? That was Cherkeshin planning his last bluff. And when the bluff had been called he left his diary with Zaitsman, his only sympathiser. Perhaps he thought Zaitsman stood a better chance of survival. But Zaitsman preferred to hide the diary."

I found Beryozkin's version very convincing. So Zaitsman, who never knew what had happened to Cherkeshin after his banishment, had an uneasy conscience, never sure till his last hour whether they had been right or wrong in thus punishing him. He had lost his diary on the way across the revolution-torn country to Krasnodar, where he decided to record what he remembered for everybody's knowledge....

That day, in the afternoon, our helicopter soared over the Valley of the Four Crosses; the tiny oasis of vegetation amid the arctic waste flitted by for the last time, and we headed for Markovo.

Thus the mystery of the lost polar expedition was solved. The chrono-scope had stood its first test. It had been a great help and we were confident it would be a still greater help in the future.

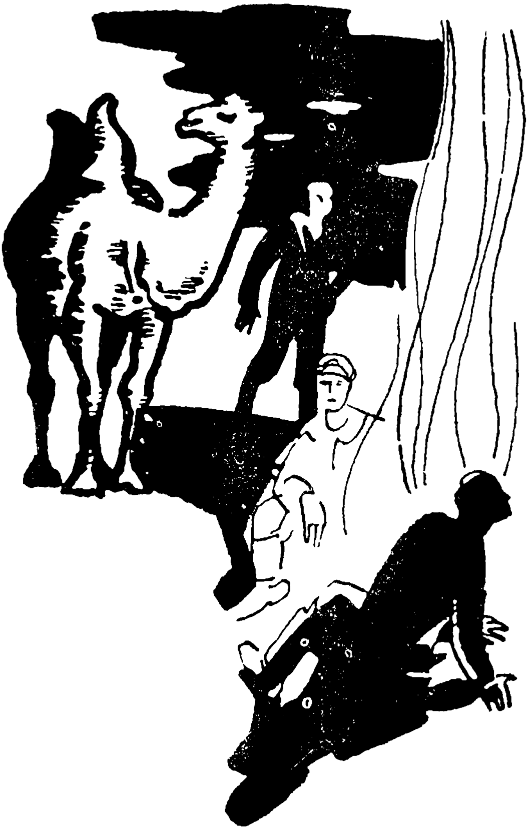
THE GOLUB-YAVAN

(On the Question of the Wild Man's Existence in the Pamirs)

by

Kirill Stanyukovich

Kirill Stanyukovich (b. 1911), professor of geobotany, has written numerous books on his subject, both for the specialist and the layman. In “The Golub-Yavan”, first published in 1959, the author shares with the readier his abundant experience of the years spent in the Pamir Mountains.



The East Pshart valley has nothing remarkable about it. It is a typical, rather wide Pamirs valley, with a dry river-bed which only fills in the hottest summer periods when the glaciers start to melt in real earnest. It is flanked on either side by gaunt mountain ranges. There is hardly any snow on their peaks, and the glaciers which hug the northern slopes in patches are small.

In the lower part, where the valley broadens out into terraces, are the fields of a big collective farm. Barley is sown there, although they are about 12,000 feet above sea level.

The gorges in the upper part of the valley provide summer pasturage for the farm's stock. You can reach these parts by car from the Pamirs Highway. But you can't get by car to the farthest end of the farm, beyond the pass.

So when we pulled up beneath the pass and saw Mamat and Sultan with horses and donkeys already waiting for us we sent the car back and pushed on on horseback.

There were five of us in the party: the Tashtambekov brothers, Mamat and Sultan, Tadeush Nikolayevich, Anastasya Petrovna and myself.

The last lap of the ascent was fairly easy and we quickly topped the flat saddle of the pass. In front of us was the wide and flat West Pshart valley, its large flood-land area occupied by pebble-beds and flood-meadows, with broad, sparsely-grown terraces on either side. In the west steep craggy slopes converged into a gorge just wide enough to let the river squeeze through.

We planned to start our investigations of this valley next day.

A little way downhill stood the two collective-farm yurtas where we intended to put up for the night. The bleating of the sheep and goats settling round them for the night welcomed us.

It was evening. There was no warmth in the last rays of the sun about to plunge beyond the mountaintops, and the wind, invigoratingly cool only a short while ago, was bitingly cold. A herd of yak-cows trotted grunting past us on their way to the yurtas. The whole day long they browse upland, untended, and then, as though at a signal, hurry home to feed their young. But they are first intercepted by the milkmaids and milked, and only then given a chance to display their motherly sentiments, feeding and licking their shaggy calves.

We were received as guests of honour. The owner of the yurta took my horse by the bridle, steadied the stirrup and helped me alight. His son pushed aside the rug that served as the door and let us pass inside, where his mother was hurriedly spreading out blankets.

Taking of our bags and other travellers' paraphernalia we sat down and crossed our legs. The master of the house sat at our side and inquired for news. There was little, however, we could tell him for he got the newspaper regularly.

His wife laid a ring of *kizyak* (Sheep's dung mixed with straw, used as building material.—*Tr)* then worked the bellows and soon had a great fire roaring right in the middle of the yurta. On the fire went a *kumgan*—a copper jug on a tall leg. Meanwhile the master of the house offered me a bowl of tea which he had just made. In deference to his guest he had poured very little tea from the porcelain tea-kettle and offered the bowl with both hands. To be precise, he held it with one hand, steadying it with the other, which is also a sign of deference.

The tea over, we insisted that supper be prepared with our food and finally had our way. After Mamat had repeatedly invoked Heaven to convince our host there was no pork in the tins, a rice soup with tinned meat was put on the fire. At this altitude potatoes or raw meat would take too long to cook.

While the supper was being prepared we had time to attend to the usual chores: unsaddling the horses and turning them out to graze, pressing and putting away the few plants we had collected and jotting down the day's impressions.

The yurta was rather crowded by now. Besides our party there were two more guests, dignified old men with beards, searching for a strayed horse.

When time came to settle for the night the hospitable people were hard put to it finding blankets for everybody. But at last all were provided for somehow, and spreading our sleeping-bags on the blankets we settled for the night. The smoke hole in the top of the yurta was closed, the lamp put out and it became completely dark.

For some time nobody spoke. Then one of the old men called softly:

"Mamat."

"Yes?"

"Going far?"

"Till Chatyk Koi."

"Spending the night there?"

"Yes."

"Not afraid?"

Silence.

"Perhaps it's bad."

"What?" I interfered.

"Mamat knows."

"What is bad, Mamat?"

Silence.

"Well, Mamat, what is bad there?" "The wild man," Mamat said reluctantly. "What wild man?"

"Simply the wild man, *golub-yavan.* He lives in the mountains."

"What's this nonsense, Mamat? What wild man? Have you seen him?

"I haven't, others have."

"Well, what does he do?"

"He shouts and throws stones down the mountain. He can carry off a woman and will challenge a man to a fight, will shout and beat his chest with his fist."

"You don't say so!"

"Don't laugh. If he throws you down he will crush you; if you win and throw *him* down he will cry loudly and run back to the mountain and die there."

"Oh, what nonsense, Mamat!"

"He is right," one of the old men said firmly.

"Of course he is," said the other.

"How do you know?" I asked. "Have you been to Pshart now? Have you seen the wild man?"

"Not now. I saw him before."

"When and where?"

"A long time ago, at Kyzylrabat."

"And why do you think there is a wild man here?"

"Everybody knows there is a wild man in Pshart."

" "But who has seen him here? Aksakal, is there a wild man here?"

"Yes," the first old man said flatly again. "Three, one man, two women and one young one too."

"Have you seen them yourself?"

Silence.

"We must not speak about him," the old man said at last, "or he will come and make trouble for us."

From what they told us later it appeared that though nobody had actually seen wild men, it was accepted as a fact by some that they existed somewhere in Pshart. They wore no clothes, we were told, were covered with fur and ate whatever they found in the mountains. They did not like ordinary humans and it wasn't wise to sleep out by yourself in those parts.

For a long time I argued with them, trying to convince them that it was all nonsense. I silenced them at last but they did not seem to be convinced.

Then Tadeush Nikolayevich cut in with the remark that if we were not careful enough we might one fine morning miss Anastasya Petrovna, whereupon we all laughed. That is, except the old men. They kept a grave silence.

Though we had the last laugh I could not go to sleep for long afterwards, remembering things buried deep in my memory.

The first time I ever heard about the *golub-yavan* was from an old Kirghiz whom I met in Kyzylrabat back in 1935. He claimed that, in his youth, when wandering from pasture to pasture with his flocks in Togdum-bash-Pamir, he once had to leave a valley with good pastures because of a wild man who carried away sheep and scared the people by shouting loud in the mountains.

The second mention came in 1936 in the vicinity of Altynmazar. It was evening when our heavily-loaded caravan bound for Altynmazar came to the Sauk Dara River, beyond which our destination lay. Fording a swollen river at night when the horses are tired was risky. Nevertheless that was precisely what my local workers demanded, saying that it was impossible to spend the night there because a wild man lived in the vicinity. He was sure to come in the night and then there would be trouble for everybody. "This place belongs to him," they insisted. When we arrived in Altynmazar a Kirghiz woman told me that some time ago she had seen a wild man near the mouth of the Sauk Dara. She hid among the boulders and he passed her higher up the slope, shouting loudly, and disappeared.

In 1937, when I was ill for close on a week in my friend Jamagul's yurta near the Togar Katy Pass, people talked a lot about a *golub-yavan* who had "come again" from Langar or, perhaps, Sarez, and now wandered round Bulunkul People should not go about alone, they said, lest something happened to them. Jamagul told me that a long time ago, "under the tsar", he saw two wild men from afar: they walked high up the slope, "dug in the earth and ate grass", probably some kind of roots.

He then said that the *golub-yavan* generally hid at the sight of human beings, as he was afraid of them, so it was difficult to see one. There were no longer any wild men round, he added, but before "there really were". However, if I met one I was not to be afraid, but just to shout a little and the *golub-yavan* would go away.

I heard more stories about the wild man in Kyzylrabat and Alai. But I must confess I could not bring myself to believe any of the story-tellers.

Ratsek, a well-known mountaineer, told me that when he was working in the vicinity of the Inylchek glacier his guide had told him that wild men lived in a crevice there.

If one were to trust these stories and try to piece them together the following picture would emerge.

The wild man, *golub-yavan,* has been seen by local people in the most inaccessible and totally uninhabited regions of the Pamirs, in the valleys of the West Pshart, lower Murgab and other rivers flowing into Lake Sarez from the south, and in the vicinity of the lower Baland Kiik, Kainda and Sauk Dara. Except for the face and hands the wild man is entirely covered with hair. He does not appear to know the use of either fire or tools but on occasion has been seen to throw stones or sticks. He avoids people and eats roots and small animals, hares or marmots, which he chases or kills with a stone. In wintertime he can run down in the deep snow a mountain sheep or goat. He is a great traveller and does not appear to keep to one permanent den.

People used to meet him much more often in the past than now.

But suppose all this is a mistake and the people of the Pamirs take a bear for a wild man, as was the case, E.M. Murzayev tells, in parts of Mongolia where bears were unknown? No, this must be ruled out, for the Pamirs people, who often hunt the bear, know all its ways to perfection.

But that still doesn't make all these stories trustworthy. In fact, plenty of local people give no credence to them.

Jurmamat Musayev, Chairman of the Lenin Path Collective Farm in the Pamirs, has for one repeatedly pooh-poohed all such reports as myths. And he knows the district as well as his own pocket. Two old hunters from the same farm,

Uljachi Urazali and Mamat Rokhopov, who have been all over the Pamirs, are quite positive that they have never met a wild man or seen any signs of him anywhere. Urazali said once, "Maybe there were *golub-yavans* in places before but there are none anywhere now."

And finally, can we believe those who say they have seen the *golub-yavan?* The easiest answer would be a negative one, for none of these cases have ever been authenticated. Nor has ever any material evidence of the creature's existence been found. Even if they do exist there can be no more than a few dozen of them in the whole of Central Asia, deep in the most inaccessible parts of it. And living as they do in the severest conditions, not far from the snow-line, they should be gradually dying out.

Somewhere at this stage I finally slid into sleep. We got up early. The sun was still behind the mountaintops but it was fairly light, and there was a nip in the air, and when we mounted and set out downhill thin ice crunched underfoot and the grass was white with hoarfrost.

Our main interest in the West Pshart valley was its trees and shrubs. There are hardly any in the Pamir Mountains, or, rather, there are so few that it doesn't matter.

Now for a scientifically-substantiated development of mountain areas a few natural boundaries have to be established. For instance, the snow-line, the tree-line and the highest altitude at which individual species grow.

That is exactly what we were after. The idea was to start from the head of the valley and go all the way down to establish these lines for West Pshart.

The first shrubs we met proved to be the false tamarisk. They were stunted, miserable creepers whose shoots hugged the ground, all but lost in the grass. They grow on pebble-beds along the river at an altitude of about 14,000 feet. That was actually the first of the lines we were interested in, the highest point where certain creeper-type plants occur.

As we pushed on downhill the false tamarisk grew in stature. At first it was just two to three inches high. But when we had covered about two miles and were 300 feet or so lower there were specimens 10-12 inches high.

Then the river entered the gorge; precipitous dins towered above us left and right and everything was at once different. There were no more cold gusts of wind, the temperature rose and we discarded our sheepskins. The crystal-clear waters of the river splashed gaily as it sped along, bound by shrubby banks. No longer creepers, the shrubs— mostly varieties of the willow—stood over a yard tall. *Comarum Salesovianum* in full bloom displayed its white, star-shaped flowers. The debris at the foot of the inclines were overgrown with shrubby cinquefoil and the tall bushes of Turchaninov's wormwood and winter fat.

It was windless and warm in the West Pshart canyon. The lower we descended the taller the shrubs became. The luxuriant growths of the willow and false tamarisk, covering every available square foot, first reached horse-shoulder, then topped the rider.

Presently there was a joyous cry, "A tree!" And indeed there it was, our first tree, a slender willow of about ten feet, hardly taller than the surrounding shrubbery. But it was a tree nonetheless, trunk, branches and all, and we dismounted to take measurements and photographs and to find the altitude.

All of a sudden there was a big pounding noise, the snapping of trampled shrubs, and heavy snorting. We straightened up in alarm—and remained rooted to the spot. Charging at us at neck-breaking pace was a troop of camels. Galloping they were, jumping over the brooks, crashing through the brushes. What could we do? The camels were closing in on us, rearing and kicking each other. I had seen plenty of camels before and had travelled on camel-back across deserts. I knew their lumbering gait and their jolting trot but I never knew they could gallop. Stories about people trampled or bitten to death by camels flashed through my mind.

Hide? But where? It was too late anyway....

The camels crashed through the last shrubs, loomed over us—and stopped dead. We were in a circle of grunting, gurgling, heavily-breathing beasts that stared at us dumbly.

They were well-fed beasts that had apparently been driven out into Pshart for the whole summer to graze unattended, as is done in those parts, arid had consequently gone quite a bit wild.

There was no telling from their flat, expressionless features why they had stampeded, what had made them stop, what they wanted or whether they were good-natured or otherwise.

Speechless, we stood inside the living ring—I gripping the ice-axe, Tadeush Nikolayevich holding his small-bore rifle at the ready.

"Mamat, Sultan, what do we do now?" I whispered, not daring to move.

"Nothing," Mamat replied.

Then he quietly went up' to a camel, tapped It on the neck and the beast turned its head and, with a nasty crunch, moved away. Then Mamat broke a willow twig and striking lightly drove the camel away, then another.

Suddenly the whole herd turned about and went away.

For some time afterwards we could not settle down to our work again and kept glancing apprehensively at the camels wandering aimlessly within sight.

"Don't worry," Mamat said. "Sultan will drive them away."

Off went Sultan and, speaking to the brutes softly, began driving them further away. They proved to be quite docile, but we could see from Sultan's stiff movements and lack of assurance that he too was afraid of them.

"They're just playing," Mamat said. "They haven't seen people all summer. The camel goes about, grazing, quite alone. When he sees a man he runs to have a look. There's no need to be afraid of him."

We resumed our work. But whether the camels really longed for human company or something else had motivated these rather dull creatures' actions, they never left us alone that day.

After another hour's tramp down the valley we again heard the noise of hoof-pounding and shrub-trampling and were treated this time to the sight of a vicious running fight between two husky camels. One of them tried hard to bite the other's neck, while its adversary kept turning round for a nasty kick, producing, when lucky, a resounding rub-a-dub of soft hooves on bulging belly. Then they cantered past.

After a while there was some noise again and a single camel rushed up to us and stood stock-still. We were face to face for some time, the beast goggling at us stupidly, till it turned round and bolted off.

Apparently the camels were trailing us, for they caught up with us every now and then that day, stared at us, and then went away.

All the time I had kept my eye open for game tracks. When I was a boy and a member of the Young-Lover-of-Nature Society I was very keen on animal tracking. At that time A. N. Formozov's splendid book, giving descriptions and pictures of many bird and animal tracks, had just been published. I was to retain that keen interest for the rest of my life.

The sandbanks and paths of the West Pshart valley looked a veritable visitors' book to me.

The most common signatures were those of camels and hares. We also saw plenty of hares in person. Whenever there was a slight broadening in the valley whole families of them scattered away in every direction. It was bad sport shooting them, however, for a hare would stop as soon as it left a bush or two between itself and us, rise on its haunches and peer about it so that all you had to do was edge forward a little, take leisured aim and shoot.

There were also occasional mountain goat tracks. Then I spotted in a patch of sand, near an overgrown brook, the broad outline of a bear's clawed foot. About midday I found another bear's print. But I saw no tracks of the snow-leopard.

About 2 p. m. Mamat pointed out an unfamiliar footprint to me. It was narrower than a bear's and had no claws. The mark was in the dry sand of the path and so not very distinct. Whatever animal had made it was crossing the path and had stepped on the sand only once.

I wanted to sketch the print when a camel warning was sounded again.

And again the crazy beasts galloped right up to us to stare. When they at last turned away and I went back to the path the print was gone, obliterated by the camels.

It was in vain I scrutinised every patch of open ground after that. I could see plenty of all sorts of animal tracks, but no bear's, and none of the other, clawless type.

Making no halts we pushed on down the river. It was gone three in the afternoon when we sighted our first sea buckthorn, then clumps of birch-trees appeared. As we rode on and the altitude diminished, the birches grew taller and towards the end of the day's journey, about 5-6 p.m., fair stands of birch wood stretched all along the narrow valley.

At seven we stopped for the night near a lovely birch grove below some high cliffs.

After the desert Pamirs tableland—cold, bleak, lifeless, with just the wind howling among fawnish-coloured rocks—nothing could be pleasanter than to sit in the shelter of some birches and listen to the rustle of leaves and the merry gurgle of water and the singsong of chiff-chaffs in the bushes, and watch a fussy little bird scale the cliff face.

Having arranged our herbariums and finished our notes on plant life we summed up the results of the day's work.

They were quite interesting too. The first bushes had been seen at an altitude of about 14,000 feet, while the tree-line lay at 10,800 feet.

Tree life at such high altitude could undoubtedly be explained by the exceptionally good climatic conditions in that narrow canyon. And that meant farming could be pushed up to greater altitudes in West Pshart than in other Pamirs valleys. This valley gets enough sun for the successful cultivation of barley, potatoes, radish and turnip.

It was a lovely, serene evening, the sunset silhouetted the mountaintops, the river babbled nearby, leaves rustled faintly, one was hard put to it to believe that it was but a day's journey to the forbidding wastes of the Pamir Mountains.

We did not bother to rig up the tent but just spread out a sheet of felt and put our sleeping-bags on it. Mamat and Sultan arranged a sleeping place for themselves not far away, in the shelter of some bushes.

We had an excellent meal, for we had even brought grapes and a water-melon with us, the whole marred somewhat by the smoked sausage which proved too heavily salted.

We went to bed straight after the meal, worn out as we were by the long trek, full of events and jolly hard work, and were quickly lulled to pleasant sleep by the murmuring of the river and the steady champing of the horses.

I peeped out of my sleeping-bag a last time to examine the cliff above us. It looked firm and solid, not likely to topple while we slept, and we were far enough for any 'loose stones to fall short. Reassured on that score, I pulled my sheepskin coat over my sleeping-bag and within a minute fell asleep.

I awoke in the night with a feeling that something had happened. I listened hard but the silence was complete and, except for the sound of the river, I could not detect anything, not even the chewing of a horse. Apparently they had had their fill and were dozing, their halters giving a tiny clink once in a while. Presently I realised I was cruelly thirsty, all because of that ghastly sausage, no doubt. I tried to ignore it but after some time could not bear the torture any longer and, summoning up enough courage, I crawled out of the warmth of my sleeping-bag.

Outside it was cold. Picking my barefoot way among sharp sticks and stones, which seemed to litter the ground in profusion, and cursing under my breath, I reached the river bank and lay down to have a drink. The drink was not long, for the water was so cold that after a few laps even the bridge of my nose felt numb.

When I came back, knocking a bucket over on my way, crawled into the bag and unfroze a little, I felt my thirst return, more fierce if anything.

It appeared I had wakened up Tadeush Nikolayevich, getting into my bag, which was next to his.

"I'm crazily thirsty," he said.

Neither of us said anything after that; I was as thirsty as ever but kept quiet in the hope he would go and bring me some water too, but he never budged. Then I gave it up as a bad job, got out again, hunted for and found a couple of mugs in the darkness, went to the river, drank a little myself and carried two mugfuls back with me. Sitting up in our bags we slaked our thirst at 'last. Then Anastasya Petrovna woke up, she was thirsty too but would prefer a nice bunch of grapes, if you please. And as I said I could also do with some grapes it was Tadeush's turn to get out, which he did, grunting and cursing.

To get the grapes he had to cross over to where Mamat and Sultan slept, and when he returned with the bunches he was cursing even louder.

"I heard they were awake, damn them, they even talked, but when I asked where the grapes were they wouldn't answer—just rolled into their blankets and played possum."

"Took you for a wild man," I suggested.

"I wouldn't be at all surprised."

We would have gone to sleep there and then but for some stones falling down the slope. Not that it worried us, for we knew we were safe. And indeed a few stones fell away from us, to our right, and crashed through the shrubs. It was anybody's guess what had dislodged them, the wind, or a wild goat, or a bear. All was quiet again and back we drifted to sleep.

When I awoke in the morning the camp was astir. Mamat and Sultan were feverishly getting the things together and packing the animals. Mamat said we must go back at once. When we asked why, he told us that the wild man had been there in the night and it was dangerous to stay.

"But did he do anything to you?" I asked him.

Mamat was appalled at my insouciance. It transpired that he and Sultan had not slept a wink the whole night and saw the wild man with their own eyes. At first the wild man threw stones from above, then he clumped all over the camp, muttering something, then he went away, throwing more stones.

There was plenty of material evidence too: scattered stones and broken bushes; upturned buckets and a ruined saddle-bag, whose contents —tins of food—we found scattered wide, badly-scratched and nearly flattened; the remains of a demolished loaf of bread and the dear imprint of a set of large flat teeth in the butter.

Tadeush Nikolayevich's evidence and mine to the effect that the two of us had walked about and upturned the buckets in the night was turned down flatly. We were told quite logically that, first, we oughtn't to invent things and, secondly, it was plain ridiculous to suggest that Mamat could ever take his chief for a wild man.

Our diffident suggestion that the bread might, perhaps, have been eaten up by the donkeys which could also have kicked the tins out of the saddlebag was swept away by Mamat who was absolutely certain he had securely tied up all the saddlebags for the night. Besides, even if the donkeys could have eaten up the bread, they would just never touch butter. So what about that bite in the butter which anyone could plainly see?

Nor did our attempts to find whose bite it was get us anywhere: the donkey whose jaws I prised open for dental comparison with the imprint in the butter, which Mamat was holding up for my convenience, suddenly snapped them shut on the piece of evidence. The next we knew the priceless imprint of a wild man's teeth was gone, gobbled up by the donkey. What remained instead was a clear imprint of the donkey's teeth, which I, in my ignorance, thought looked like the other one but actually was, on Mamat's authority, quite different.

Despite a long discussion which went on at breakfast and all the way back we could never reach a common view of that night's events.

But now, a few years later, I am in possession of some new information on the *golub-yavan* which I obtained from an old man I met in Pshart this year, looking for a strayed mare.

This worthy man told me that a few years before an expedition of five, one of them a woman, had spent a night there, in Pshart. Their chief was called Zor Adam (the Kirghiz for "big man", my name around there). In the night a wild man came, he shouted and threw stones from the top of the mountain, then he got down, ate some bread and butter and even bit through several tins and ate the contents. Then he wanted to take the woman with him, but Zor Adam fought him and threw him down and the wild man cried loudly and left for the mountains, throwing stones as he went. Many had seen this, for example Mamat, whom that worthy old man suggested I contact for further information. Unfortunately I can't cite the good man's name either, because, after a chance remark of my assistant revealing my identity, he thought he could not really stay any longer and immediately departed in search of his strayed mare.

FLYING FLOWERS

by
Mikhail Vasilyev

Mikhail Vasilyev (b. 1920), a qualified engineer, is now a full-time journalist. His popular-science books Space Travel, Man and Energy, Reports from the 21st Century (written in collaboration with S. Gushchev) have been translated into many languages. At present he is the science and technology editor of the youth daily Komsomolskaya Pravda.

I

The mountain stream plunged down a three-hundred-foot precipice. Gaining the edge in a tearing hurry it made its first madcap leap; from a distance it seemed that a bluish-green ribbon hung from a grey rock. The other end of the ribbon was lost in a white cloud of spray where the stream smashed against the gargantuan boulders.

All in a lather of white foam now and generously tossing it to either side, the stream leapt on impatiently from level to level as it hurried down the slope. After a final dash into the grey murkiness of the gorge it joined a bigger stream and together they continued their journey to the sea.

Zavyalov half-lay oft a narrow ledge of rock just above the place where the spray shot from below met the bluish column of water. Occasional gusts of wind drove spray against his face. The ledge was wet and slippery and not exactly a safe place to linger.

Zavyalov pressed his right cheek against the cold roughness of rock. The waterfall was right in front of him. From so close it no longer looked a bluish-green ribbon, but what it was: a torrent of water, mighty and furious, in veins of foam and dirt, eager to snatch up and batter to death anything that got within reach of its cold embrace. He turned his head gingerly and pressed his left cheek against the rock. His glance travelled along the bare basalt. No, there was no hope of climbing that wall. A seasoned mountaineer, he had realised that when he was standing at the foot of the cliff, appraising, some forty minutes before. But he thought he would try all the same. And he had, seeking precarious purchase in every crumbly bit of weather-worn rock, every cleft produced by roots of some plant. It had taken him forty minutes to get to that ledge, forty minutes of tremendous risk. He ought not to have indulged himself, not really, he thought now.

Again Zavyalov moved his head cautiously, glancing up this time. His goal was quite near. About sixty feet higher and across the fall, where there were human figures carved in the cliff face, some aiming their bows, standing on one knee, others throwing spears, still others rowing.

Just below the group of carvings gaped the dark mouth of the cave. A big black cross topped it, running through the whole group and badly damaging some of the figures; obviously a later addition.

It was those primitive ornaments that had first roused his interest. Quite a find at this altitude too, almost next to the snow-line, and he thought that many an archaeologist or ethnologist would have given much to be in his place. Of course a party of geologists, only four of them at that, including their guide, a local hunter, could not be expected to do archaeological investigations. But then what actually interested him at the moment was something different. How did the people who had left behind eternal marks of their presence manage to get to the cave? Did they use other, easier means of access? Or, perhaps, the waterfall, which was in his way, appeared at a later stage, cutting access to the cave from this side?

And, indeed, across on the other side he could pick out a few likely footholds. By stepping on that fawnish knob one could reach as far as a small bush, that should mask a cleft of some sort. From there, placing one's left foot on that black slab, one could pass into a fifteen-foot-long chimney. That would be easy to scale. And above it there was something in the nature of a ledge, barely noticeable from this distance. Yes, the way to the cave continued just beyond the waterfall. By no means easy, but certainly climbable.

On their way up, two fat green caterpillars crawled busily past Zavyalov's cheek. It's easy for them, he thought, they've got eight legs, and I only four, legs and arms together.

Zavyalov moved a bit. His body felt numb. Pressing his side to the rock, he eased one leg for a few moments, then the other. Then, finding the best position, he reached out his left hand for his field-glasses. They felt extremely heavy: the arm seemed to outweigh his whole body. For one fleeting moment he felt he was losing balance and falling. Vertigo swooped on him. With a great effort he steadied himself, chin pressed against wet rock, drew the hand with the glasses up to his face and again turned his head. The other side of the cliff face was so close in the eyepieces that it seemed he could touch it with his hand. And it was definitely climbable, right to the cave mouth, as he was able to ascertain, picking out the way with an eager eye. But how could one get there over that fifteen-foot-wide quivering ribbon of water?

Zavyalov lowered the glasses; the wall he had been examining leapt back into place. Even as it did so the stone his right hand had been gripping dislodged, ready to fall. Automatically his left hand dropped the field-glasses and clutched at the rock for support. As he recovered his balance, his glasses disappeared in the spray below.

"Must climb down, I'm dead tired," he told himself aloud and never heard his own voice for the roar of the falling water. It was only then that, for the first time, he became aware of that mighty roar. He shouted as loud as he could, but still could not hear himself.

Snake-like, he inched his way forward along the cold slippery stone. At a point where the ledge was almost petering out he finally stopped and looked at the foamy fringe of the water column right next to his face. The main mass of water curved out from the cliff, it was a leap, not a glide. A few large drops struck his cheek. Hugging the wall, he began the descent.

He stopped for a breather on a flat rock. He had not yet reached the bottom, but what remained was not so difficult. He sank down with his back propped against a rock and stretched his legs. His knees were shaking, all the strength was drained out of his arms, so that he would not even have been able to undo a button.

He felt fear....

The sun emerged from behind a mountaintop; the slope was decked out with yellow, blue and red flowers, pastel-tinted and fragile-looking, but really quite tough and well adapted to fight stern nature. Their subdued beauty made them especially dear to him. For a long time he watched a large velvety bumble-bee making rounds of the flowers. He would cling to the edge of a flower, plunge head first into the calyx until almost nothing was seen of him, then reappear in a little while, clean his front legs matter-of-factly and, yellow with pollen, buzz on to the next.

A large, exceptionally beautiful butterfly alighted on his damp shirt. Settling down comfortably, it opened and closed its wings as if fanning itself. Zavyalov sat quite still. Another butterfly perched on his knee, a freak with one wing much smaller than the other. A third one fluttered down on his forearm. Its body was noticeably bigger than the bodies of the other two. They all opened and closed their gaily-coloured wings in unison, as if keeping common time.

II

Nikolai and Olga lingered just outside the circle of light from the camp-fire. Zavyalov guessed why:

Nikolai had been carrying both rucksacks and now one of them was changing hands.

Their job for the day had been to explore the western branches of the valley. Zavyalov was a bit surprised when Nikolai, a tall lithe boy, showed him their route on the map: he had never expected they would be able to cover so much.

"Well, and what have you got to show?"

Nikolai produced the specimens: a few chips of granite and quartz, several kinds of rock-crystal, and an assortment of pebbles picked up on the banks of mountain streams. Pebbles were useful as an indication of the type of rock one could expect upstream.

Zavyalov took out the Geiger counter and, putting on the ear-phones, checked the specimens for radioactive content. (Uranium prospecting was the purpose of their expedition.) The granites and gneisses gave the usual two to three clicks, while the rest did not yield a sound.

"My luck's been no better," he said, "the mineral's lying low. And plenty of it too, believe me, I can smell it. My nose has never let me down yet. Well, we'll talk business tomorrow. Let's have our meal."

While they ate Zavyalov told them about the cave, omitting the climbing part of it as pedagogically unsound. Foolhardy risk should not be encouraged in budding geologists. There is enough danger in a prospector's work as it is.

His story, however, failed to evoke any response in 'the two students, tired after the day's exertions. But it did in the fourth member of their team, their guide, who went by the somewhat familiar, though affectionate nickname of Dad.

"That place's called Gamayun's Cross and the cave—Gamayun's Cave. But there's no path to it. Nobody has ever been in it. Only the mountain spirits can carry you inside there. You've got to know the magic word for it."

"You say nobody has been there, but who carved those figures and the cross then?"

"Oh, that's a different story. Gamayun did it."

"Tell us about Gamayun," Olga wanted to know.

"Gamayun was a rich hunter, they say. A greedy and evil man he was, would never do a good turn to anybody. He had an only daughter who was called Din. Beautiful as a picture she was. There was not a lad in the village who wasn't gone on her. The richest men in the district offered huge bride prices for her. But she fell in love with Gits, her father's herdsman. They decided to run away and get married. 'The world is big,' Gits would say to her, 'there must be other places where I can fetch a mountain ram with an arrow or spear a bear.' Gamayun learnt about this plan—he was a wizard and nothing could be kept secret from him—and in the night when his daughter was to run away he gave her a sleeping-potion. Then he called the mountain spirits and with their help took her to a hiding-place which even Gits, who knew all the paths in the mountains, would never find. Gamayun had his own plans for Din: he wanted to marry her off to a rich old man from a neighbouring village and get a really big bride price. The old geezer already had three wives but was eager to marry Din. And she was fifteen at the time—best age for the bride in our parts.

"All that night Gits waited for Din with a pair of horses at the end of the village. When dawn came he decided she had betrayed him, swung into saddle and galloped off into the mountains. His horse was quite winded when he dismounted at midday near a mountain spring. He sat down and thought what was to be done. Meanwhile Din woke up in the cave where the mountain spirits had carried her. In the very same cave you saw today, Sergei Andreyevich. Dripping wet she was, for 'the spirits had dipped her into the stream. She got up from her grass bed, went up to the cave mouth and saw a sheer wall of rock and a waterfall roaring away at her feet. No way out! What could she do? And suddenly she heard a few thin blades of grass that hugged the cliff speak to her in human voices.

" 'Do you want us to tell Gits where to look for you?' they asked her.

"'Oh, yes,' said Din.

" 'What will you give us for it?'

" 'What do you want?'

" 'Your beauty and your strength.'

" 'What do you need them for?' Din asked, surprised.

" 'We need your strength the better to cling to rock and fight the wind. We need your beauty to be admired by everybody. Look how weak and ugly we are now.'

" 'And what will remain for me if I give you my beauty and strength?'

" 'You will have your love. Why, surely that is your proudest possession.'

"Indeed What's there in strength and beauty when there is no love, thought Din and agreed.

"And that very moment the most beautiful flowers blossomed forth everywhere she could see. The bluebells took the blue of her eyes, the carnations the scarlet of her lips and the violets the whiteness of her arms and shoulders. Din did not know it all had been taken from her, only she felt a sudden weakness all over her body and sank down on the granite. And when she looked at her arms she saw that they had become grey, coarse and flabby like an old woman's. But even that did not make her feel sorry, because there was nothing but love in her heart now.

" 'But when will you do what you promised?' she asked.

"Then one of the flowers broke off its stem and, flapping its petals, flew away. It rose higher and higher, so high that it could at last see Gits sitting beside a spring. Then it dropped on his shoulder and told him where to look for Din.

"Gits sprung into the saddle and galloped off. He was strong and brave. But nobody could get to Gamayun's cave without the help of the mountain spirits. Gits climbed half the way and knew he could get no further. So he hung on to the cliff, Din sat in the cave and the waterfall roared between them.

"Then Gits struggled upright, found a foothold in a cleft and shouted so loud that Din could hear him above the torrent's roar.

" 'Jump over to me!' he shouted.

"The former Din could have jumped over the stream straight into Gits' arms but, having given all her strength away, she only jumped halfway. The waterfall seized her and swept her down, but Gits stretched his arm and caught his beloved, though they both nearly perished as he .did so. With Din in his arms. Gits got down the cliff, mounted his horse and galloped away.

"Gamayun came back to his cave and could not find Din. He understood it was Gits who had taken her away and was so angry he decided they both must die. To cast an evil spell on them he had to draw those who were to fight Gits. But he had nothing to 'draw with. So he seized a rock and began hewing figures with it in the cliff face. He first sent a bowman against Gits. The bowman shot his arrow but Gits caught it in the air, turned it and hurled it back. And it flew and pierced the bowman's chest. That night Gits was stronger than all the enemies Gamayun had sent against him. Nothing is stronger than true love in this world.

"When the lovers had galloped so far away that Gamayun's magic could no longer reach them, Gits dismounted and made a fire. He laid Din down beside it because she was so weak she could not even sit up. There was only love in her heart and one cannot live by love alone. And so she died, her head in Gits' lap, her arms round his neck.

"They say Gits died soon afterwards. How could he live when every flower reminded him of Din—the roses, of the gentle colour of her cheeks, the bluebells, of her blue eyes? ..."

"And Gamayun," Olga asked softly, "what happened to him?"

"Gamayun? When Gamayun learnt about his daughter's death remorse began tormenting him, they say. He took a rock and hewed a cross in the cliff above the cave. And the mountain spirits left him, for a cross strikes fear in them. Then he disappeared. Whether he died in the cave or threw himself into the waterfall, nobody knows...."

"How long ago did all this happen?" asked Zavyalov.

"My grandfather told me this story, and he heard it from his grandfather, who used to say that *his* grandfather, when he was quite young, knew an old man who, as a small 'boy, saw Gamayun."

"You told it beautifully, Dad," said Olga. "Do you think it's a true story?"

"Hard to say. Tales aren't all lies, I s'ppose, nor all truth either. But there's always a bit of wisdom in them. It's wise people who tell them in our parts."

"What splendid, all-powerful love," Olga said, gazing at the dying embers. "And what a wise philosophy: love is stronger than anything in this world but man cannot live by love alone. How beautiful and how true.... So the alpine flowers' loveliness is the beauty of the dying Din.... But what could that flying flower symbolise? I have never met the metaphor before. Have you, Sergei Andreyevich?"

Zavyalov started. He, too, was under the spell of the hunter's tale but his train of thought had been different. He had remembered things from his past, things that were gone but not forgotten. How he longed the girl would call him Sergei, and not Sergei Andreyevich. She was at once like and unlike the other one. Yes, of course, she was better than the other one, if for no other reason than because she was here with him at the camp-fire. The other one would never dream of going away from the comforts of the city unless she went to a fashionable seaside resort. How he longed— But Olga would never know about it. He was past thirty and she just twenty. Besides Nikolai was obviously attracted by her. They'd make a perfect match. And he, as head of the team, really had no business going about courting a student on her field work with him.

"Why don't you say something? Have you also fallen asleep?"

"No, I was thinking."

"But tell me, have you ever heard of flying flowers in some folk legend or other?"

"Not that I know of."

"Must be a local image then. They usually stand for something quite concrete."

III

"To think that you could fall asleep in the middle of such an absolutely wonderful legend! No, you're not human, Nikolai. Not a live spark in your heart."

"I'm a geologist. Legends interest me to the extent they have some bearing on my job. Had there been mention of an abandoned quarry or some such thing in it, I'd have pricked up my ears.

But there was the usual rigmarole: beautiful daughter, tyrannical father, and, of course, poor but valiant suitor."

"But what about flying flowers? Even Sergei Andreyevich says he hasn't heard about this image."

"Flying flowers might interest botanists, but I'm a geologist."

"Stop harping you're a geologist. Sergei Andreyevich is also a geologist but look how wide his interests are. Archaeology, ethnography, Chinese medicine.... And d'you know what he's most keen on?"

"No."

"Prospecting on other planets. Going as a geologist with the very first space expedition. He has even written poetry about space flights."

"How do you know?"

"They remember his verses at the Institute ever since he was a student. Want me to recite them?"

"Fire away."

Zavyalov made a wry face. The youngsters were apparently not aware he had returned and could hear them from the tent. But how had that inquisitive girl laid her hands on his rhymes? He had written them and he had wanted to become the first astroarchaeologist. For that matter he was still very active in the astronautics section.

But he wrote no poetry any more. Ever since that time.... Rita had been married for five years now, yet he still felt stunned. Working like a beaver, lecturing, doing research—anything to help forget. Perhaps he shouldn't have done it? After all it was he who gave up Rita because she wouldn't go his way. Perhaps he should have gone her way? Then Rita wouldn't have become the wife of that fellow .... "that accountant fellow", as he called him at their last meeting. What did she say to that? Trotted out a proverb: she believed in proverbs, particularly in the type coined for the specific use of the well-fed and satisfied. Something like "A bird in the hand is worth two in the bush". He was the bush part of it—WT operator-gunner in the war years, later honours graduate, then research student at the Geological Prospecting Institute, until he gave up his post-graduateship in the second year for field work. That was what had caused the break.

"You don't know how to get on in life, like people do," she told him. Yes, he did know how to get what he wanted, but he wasn't looking for the same things in life as she was, their ideas of happiness were different. But what *is* happiness?

Last night Dad said that man can't live by love alone. But can man live without love? He had— for five years. But could that be called life?

Yes, of course, work you like was the main thing in life and the choice he had made was right. But then why all these memories? And now this young girl, Olga.... And again somebody else's....

Outside, the howling of the wind in the ravine added to the rattle of the mountain torrent rushing along in its stone bed. This made a fitting background to the tale of space conquest that a girl's voice was reciting with great feeling and utter conviction.

A thrilling journey! Though terrestrial skies
Seem blue and clear, yet on our way through
space
Uncounted obstacles and dangers will arise:
Magnetic storms, tremendous meteors, cosmic
rays,....
But we shall triumph! Yes, we shall! And
there, afar,
Beyond the reach of any poet's dream,
There, luring us, our goal—another star
Through endless night mysteriously shall
gleam.

Our trajectory nearer as we trace,
Upon our radar's palpitating screen,
A strange and lovely planet's clearing face
Adorned with streaks of lightning, will be
seen....
With chains of islands scattered there and
here,
And weird contours of unearthly sea and land,
Before our gaze, fantastic and austere,
A new world will arise—and then expand...

The voice stopped, as if snapped at the highest pitch of emotion. There was a few moments' silence. Then the dialogue started afresh.

"He spreads himself thin, your Sergei Andreyevich. Fewer rhymes would have got him his doctorate long ago. And here he is, climbing rocks with us. Is that your idea of life—tent, fire and all?"

"Stop it, Nikolai!" Olga nearly screamed. Zavyalov visualised a wrathful face with a pair of deep, burning eyes, now a much darker shade of blue than usual.

"Oh, what a rotten thing to say! Why, he's had several invitations from his Institute and from the Academy of Sciences.... His articles are quoted in textbooks. And you—you're just a schoolboy compared to him."

"Tut, tut, my dear girl, I should have thought you could spare my silver-haired head that avalanche of wrath," Nikolai sounded somewhat taken aback by Olga's outburst. "All right. They invited him and he said no. He's a genius, and I'm a schoolboy. But all I was trying to say was that he spreads himself thin over too many undertakings. And that goes for you too. Take today's butterflies. What's in them for you? See my point? Catch *me* saying no to a readership at the Institute."

It was high time he had put an end to this involuntary eavesdropping. Zavyalov coughed. The voices stopped abruptly.

He stepped outside and went over to the shed.

"Well, what're you doing?"

"I'm sorting out the specimens and Olga's amusing herself with butterflies."

Nikolai's reply was a patent challenge but Zavyalov chose to ignore it. He looked through Nikolai's entries in the team's log-book, making a few casual remarks. The young man knew his job well. Then he turned to the girl who was bent over an empty food box topped by a piece of glass. A few fair curls had escaped from under her square on to her knitted brow. She was peering inside the box. Under the glass there was a colourful collection of luxuriant butterflies such as those Zavyalov had seen by the waterfall.

"Aren't they absolutely lovely," the girl said. "If I'm not mistaken this is a species not described before."

"But you are. That is an ordinary species, though changed a lot through certain environmental conditions."

"These being?"

"Radioactivity. Look at all these mutations, in colour and form and size. Incidentally, where did you catch this lot?"

"By the waterfall. I went to have a look at Gamayun's Cave. But you know it's not as untrodden by man as it looks. People have been there before and not so long ago."

"What makes you think so?"

"Here's what I have found there." Olga showed him a badly battered metal binocular casing that seemed to have passed through a crusher. There was anxiety in her eyes.

"Stop worrying, Olga, those were my field-glasses. I broke them accidentally and threw them in the water, which did the rest. But what is it that interests you in those butterflies?"

"I was dead keen on collecting all kind of insects when I was a kid. It's very interesting, really.

It's a world apart, full of its own mysteries. Do you know, for instance, that a butterfly can locate another at a distance of a little under a mile even without seeing it?"

"Yes. They say butterflies have an acute sense of smell."

Olga shook her head.

"No, I don't think that's the answer. How could a sense of smell, however acute, help a butterfly amidst a flower-field full of the most different aromas of the greatest intensity? Is it possible to single out a faint smell from that riot of scents? It's something else, I'm sure. I did a bit of an experiment today. I placed a butterfly under a tumbler downwind from another butterfly—in case a little of the smell got out—" "And what did you find?"

"I repeated the experiment several times and on all occasions the second butterfly was soon fluttering round the tumbler."

"How do you explain this remarkable communion? By telepathy?"

"I don't know.... Of course, butterflies don't think but they might emit some radio waves. And locate one another as if by a radio beacon."

"I was struck yesterday by the way they opened and closed their wings, basking in the sun—all in time, as a company of soldiers at drill. Of course they could see one another. I don't think telepathy has anything to do with it, really."

"Well, let's see."

Olga turned over the pane of glass covering the box. There were a few butterflies on it. One of these fluttered away. The others, comfortable where they were, began moving their wings in unison. Though well apart, they seemed to operate as identical components of a single mechanism.

Olga took a piece of cardboard and put it vertically on the glass, cutting the group of butterflies in two. Wing movements in both groups remained synchronous.

"There you are, Sergei Andreyevich, it's not sight, you see, it's something else."

Zavyalov was obviously interested. And he liked the neat and clever way in which Olga had done that little experiment. So it was not sight. What was it then? Radio waves? Some kind of tiny oscillations, not detectable, or, perhaps, not detected by anybody? And if so, was it endemic or common to all lepidoptera?

These questions merited further study. For all he knew nature might have employed some novel principle here that man could benefit from. It wouldn't be - such a bad thing, for instance,- to develop a one-mile-range receiver-transmitter the weight of a butterfly. That would presumably be a hundred times lighter than existing types.

IV

Again Zavyalov was on the narrow ledge above the waterfall. Again alone. Over the past two days he had progressed from surmise to conviction but he felt the evidence he had was too slim to share with others. So he had gone out alone for a final check.

The sun shone brightly aloft and there was a brilliant rainbow arched over the quivering silver-specked mass of water. The drops that reached the warm granite evaporated quickly; fine wisps of vapour curled up and disappeared. Taking every precaution Zavyalov stood upright, facing the wall. His left hand clutched at the cliff wall almost at the water's edge whence he now proceeded to inch his way, very slowly, until his face felt a cooler current of air caused by the precipitous fall of water. But this wasn't the main stream, this was just its left flank, and he had counted on it not being very thick.

Zavyalov felt no fear this time. On the contrary, he was buoyed up and sure of success. Presently, finding a secure foothold, he ran his left hand along a crevice into the stream and beyond it. The impact on his arm of that accelerated mass of water was terrific but he knew he could just make it. Then his foot followed, and, surprisingly enough, quickly found firm purchase. He made a dash and emerged—after a cold shower—behind the greenish-blue curtain of water.

As soon as his eyes got accustomed to the quivering twilight he saw that, despite the wetness of the rock and the water sluicing down in places, ascent was possible.

Then to his great surprise Zavyalov noticed an iron hook sunk into the wall not far from his face. It was ruinously rusty but it resisted the tug he gave it. So that was the mountain spirit that had helped Gamayun to get into his cave. If Gamayun had done it, surely he could do it. Soon he was at the cave mouth.

There was a small flat space in front of it, which had escaped his eye. The despotic father must have been standing on it while he hewed the figures meant to bring peril to his daughter and her lover. But was it really Gamayun who had carved them? The explorer's heart gave a leap. He noticed that some of the figures were worn smooth by time, others half-obliterated through cracking and the fall of weather-worn rock. That could not be the work of two or three centuries. Twenty to thirty millenniums, more likely. That was the estimate that his experience as a geologist suggested to him.

But if the Gamayun legend was an invention, pure and simple, a whole chain of circumstantial evidence would fall to the ground. No, that could not be so. It was Gamayun—a filicide and an unintentional suicide—who had sunk that hook into the rock and provided himself with a hiding-place that was to become his tomb.

He would of course take pictures of the figures and then make a detailed sketch of them in his notebook—in case his camera failed. In any case they would appear in *Problems of Archaeology* not later than next spring. They had waited for so many centuries that a few more months would be of no importance.

Zavyalov swung into the cave. The entrance was lit brightly by the rays of the sun. His first few steps inside the cave felt as though he were treading a deep-pile carpet; an accumulation of cocoons of countless butterfly generations, he guessed. This soon gave place to rock floor. Here it was darker, and Zavyalov halted for a moment to allow his - eyes to accommodate themselves.

Suddenly there was a hollow thud behind him, the floor rocked slightly, stones rattled down from the vault, and he found himself in complete darkness. Zavyalov broke out in cold sweat. Cut off! Trapped in a cave where a few hours' stay spelt death. In that same cave that had robbed Din of strength and beauty, and her father of life.

Zavyalov switched on his torch. The subsidence was not extensive and apparently only involved a single slab of granite. But it was big, and had slid squarely across the entrance, all but sealing off the cave so that Zavyalov could only force an arm through in one place. Enlarge the hole? What a hope! That'd take him three to four days, which he didn't have. He could not even wait till the morrow when his companions would start a search for him. They would tumble to his going out to explore this cave, of course. But would they guess where he was? No, they'd more likely decide he'd fallen into the torrent and look for his body downstream. He might shout all he could, they wouldn't hear him above the roar of the waterfall even if Nikolai climbed up to that ledge.

He ought to get a grip on himself and think coolly.

It wasn't so much the thought of death, he reasoned. He'd faced it before as he hovered over towns looking like gigantic fiery hedgehogs, a target for searchlight beams and tracer flak. But he hated the idea of meeting his end in this way and shelving the riddle of Gamayun's Cave for many, many years. Though, in fact, he wasn't as yet quite sure he himself held the solution.

Playing the beam of his torch about him, Zavyalov went deeper into the cave. It gradually widened, though not much, while its ceiling receded sharply, making the cave a narrow cleft in the massif of granite. Suddenly shivers ran down his spine: picked out by the fitful light of his torch, a man appeared in front of him, eyes ablaze, lips stretched in a malevolent grin, displaying a set of glittering teeth highlighted by little tongues of bluish flame. In fact, the very time-honoured image of a ghoul or one of the Devil's own minions.

Plucking up his courage, Zavyalov took a couple of steps forward and trained the torch beam on the ghost's face. It was the dead face of a mummy half-seated in the shallow recess in which the cave ended.

The man who had been thus mummified must have been a real giant in his lifetime: hunched as he was his head was level with Zavyalov's. He had to be, thought the geologist, to be able to drag his daughter all the way up to the cave. So this was Gamayun—clad in a linen shirt over trousers of the same material and a leather belt....

And that solved the riddle of Gamayun's Cave beyond a shred of doubt. The cave indeed was made up of minerals bearing fantastic, unheard-of radioactive concentrations. How big the valuable deposits were had yet to be explored, but their high grade was a certainty even now.

He retraced his steps back to the cave mouth. What could he do? Write a message, it occurred to him. By the vague light from the hole he jotted down a few lines about his discovery on a page torn from his notebook, made a dart with it and threw it outside. He repeated the motions nine times—the number of blank pages left in his notebook.

This done, he thought hard. What else could he do? In his place Din had sent her lover a flower. Perhaps she had just used it to scratch her message on? It didn't sound right though. Why a flower, when it was easier to scratch her message on a leaf or a piece of cloth torn from her dress?

The youngsters back in camp must still be unaware of anything. Dad was cooking their meal and Nikolai sorting the specimens. And Olga? Well, Olga would most likely be studying the mysterious mechanism of butterfly communication.

A flying flower.... Could Din not have written her last love-letter on a butterfly's gaudy wings? Supposing he tried.... No, what utter rubbish.... And yet—who knows—what if it succeeded?

An idea was struggling in his mind, which he had first dismissed as utter rubbish, then took up tentatively again, then— After all, as one condemned to death he had nothing to lose, he told himself. And his life was the stake.

V

"You think he overheard the little conversation we had this morning, do you? That might mean a failure for me in my field practice. What the devil made me blabber my opinion of him."

"How disgusting you are, Nikolai!"

"Why are you so rattled? I'm doing my job well, aren't I, and always will, all my life, be on top of my job whatever it is. And all the rest is just a. ruddy nuisance that gets on one's nerves—

Anyway I don't quite see what's biting you this time."

"It's just that doing your job well still doesn't make a man out of you."

Nikolai offered no reply. For a few minutes both went on with their work.

"Look, Nikolai!" Olga exclaimed all of a sudden. "What's that?"

"Butterflies," Nikolai said nonchalantly, stepping over to her.

"But look at the way they're moving their wings...."

"The usual way. All together. You've already admired the fact together with your darling Sergei Andreyevich."

"Look at them," Olga was saying, disregarding his words, "they've always moved their wings at even intervals before. Now they're uneven— longer and shorter."

"Using Morse code, eh?"

"No, impossible ... wait ... give me your pencil."

On a scrap of paper she began hurriedly putting down dots and dashes for shorter and longer wing movements. Soon she had a few lines ready.

"Now for the decoding," said Olga.

“Can you do it?”

“Yes.”

"Where did you learn?" "I went to a radio ham circle at school." "Whatever for? Too much time to spare?" "For this particular occasion. Just for this once. There you are. Just read it aloud."

" 'Am in cave. Need help. Zavyalov.'"

VI

In the evening they gathered round the camp-fire as usual.

"You see, geologically this place looked a typical uranium-bearing area. There's no point in going deeper: you know all that stuff. But to strike uranium was an entirely different matter. There might not have been any at all in the first place, or it might have been dispersed in minute quantities in granite. It's the butterflies that I owe my hunch about there being an open deposit somewhere near. You know that radioactivity causes mutations in insects. And I'd never before seen so many mutations as at the confluence of the two streams. That was why Olga could not recognise an ordinary butterfly.

"Soon I managed to locate the rough boundaries of their habitat. It was in the area of the water-fall. The mutation butterfly was extremely rare farther upstream and plentiful downstream—carried there by the wind, I thought, which always blows in the same direction here. So I began exploring the area.

"The water and pebbles proved only slightly more radioactive than normal; so if there was any uranium about it had no direct contact with the water. Yet it was obvious that the local butterflies were exposed to high levels of radioactivity in the chrysalis stage. That prompted me to search for a deep crevice in the rock where the chrysalises might mature.

"Then it was that I stumbled on Gamayun's Cave.

"It's remarkable qualities must have been known to the stone age men. Possibly the cave and the whole cliff were held sacred in those days and used for pagan rituals. That must also have been the purpose of the figures carved in the cliff face.

"All this was very circumstantial, of course, and I hesitated to bring it up. I tried to reach the cave on my own and failed. The climb was much too risky. I ruined my field-glasses in the attempt and decided to stay content with taking pictures of the cliff face with a telephoto lens.

"However the tale Dad told us gave a new fillip to my speculations. A cave where a girl loses her strength and beauty could only have been a radioactive one. The same could have killed Gamayun. But in a legend deeply rooted in folklore fact is inseparable from fantasy. In this one, for instance, Gamayun is credited with carving figures, which had existed for tens of millenniums before his time. So could the rest of it have been just fantasy, for that matter. And though personally I was almost convinced, I again said nothing to you and ventured out alone. Which nearly cost me my life.

"The final proof that the cave was a radioactive treasure-house was furnished by the mummy. The whites of its eyes, its teeth and nails were phosphorescent due to prolonged radioactive exposure. There were no signs of decomposition because radiation killed all the microbes. But I had this proof only when I myself became a prisoner and was looking for a place next to Gamayun.

"I wrote my message to you, threw out a few copies of it in the hope somebody might pick it up, and prepared for the inevitable.... But then an idea occurred to me.... You remember the legend mentions a flying flower. Now a butterfly could be that. I even seemed to remember I'd come across a similar metaphor in a Persian -epos I once read.

"You remember how amazed we were at the butterflies beating their wings in unison and even wondered who their drill-sergeant was. I'm not affirming anything, but I'd like to advance the idea that wing movements cause the impulse by means of which they manage to communicate. They are their own drill-sergeants, at it were. So why shouldn't I take over the job for a while, I thought.

"I knew that Olga would be studying her butterflies just then. So I caught a most gorgeous butterfly as it was about to flutter outside and stretched down at the hole. The rest I did with the help of two needles. Imagine my joy when I saw a butterfly basking outside open and close its wings in time with the one whose wings I was manipulating. Apparently quite a few butterflies in the locality must have been doing their physical jerks at that time in Morse.

"I'm not at all sure what learned lepidopterists will have to say on the matter. They might even say that nothing of the kind happened or could have happened. And any experiments they made would probably bear them out. But the fact is that here we're dealing with a unique case of mutation, going back countless generations. And, perhaps, this feature, which can be observed with the ordinary cabbage butterfly, has, to my luck, reached a high level of development with this particular mutation.

"I replaced the tortured butterfly after a while by another one. There are millions of cocoons in the cave; it's an enormous nursery. And in about two hours I felt somebody tugging at the rope I'd payed out through the hole. That was Nikolai and just about time too. I pulled it in and found a stick of dynamite at the end. The rest was easy.

"As the senior member here I'd like to stress one point. Geology is by no means a narrow science. A geologist should know a thousand and one things which might appear to have nothing to do with-his job. But this goes for other sciences too. Nowadays new developments are taking place increasingly in the border regions between two and more sciences, as Academician Zelinsky once put it. Without knowledge entirely optional for me as a geologist we could have missed our uranium deposits and I might have lost my life.

"And one more thing. For a scientist knowledge and opportunity to increase it should be the two most important things. And, believe me, the post he occupies, the string of letters he has after his name, the fees he gets—all that is secondary."

That night Zavyalov and Olga were the last to leave the camp-fire. The geologist was jotting down notes in the log-book, the girl, sitting with her arms round her knees, was peering into the dying embers of the fire.

"Sergei Andreyevich, would you mind if I asked you a personal question?"

"A question? Why, you're welcome."

"Why are you not married?"

Zavyalov had expected anything but that. He was not aware that a woman can detect a man's love for her on infinitely more slender evidence than he had used in unearthing the uranium deposits. A little embarrassed, but looking straight into her eye, he said softly:

"If you wish I will tell you about it. You and nobody else.... But not here—in Moscow when our field practice is over."

VII

Zavyalov dialled a number. It was a number he knew by heart but for the last five years had never dialled more than once a year. And out of five times he had heard her voice only once. Hearing to the end all those "hallo, press the button, use another line," he had hung the receiver in silence. That had been two years ago. Now he answered at once.

"Rita, this is Sergei. You have not forgotten me completely, have you? I'd like to see you. For a minute, or for an hour, I don't know. But alone and immediately."

In ten minutes he saw her in the opening door. She had changed. She had filled out and was even more beautiful. But he knew at once she no longer had any sway over him....

He could go now: after all that was what he'd wanted to be quite certain about.

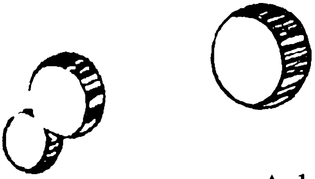
Meanwhile Rita searched in her mind for something to say. Weather was trivial, how-are-you and all that, too general.... She thought she knew what had brought this man here. But he never said a word and suddenly she noticed something.

"You have two new medals?" she said in astonishment and envy, looking at his chest with those blue innocent eyes of hers whose purity he had so loved. "My husband hasn't got a single one. And probably never will have, the imbecile. He doesn't know how to get on in life.... But where're you going, Sergei dear?" she said and stretched her plump, marble-white, beautiful arms to him.

Never saying a word, he turned on his heel and went away.

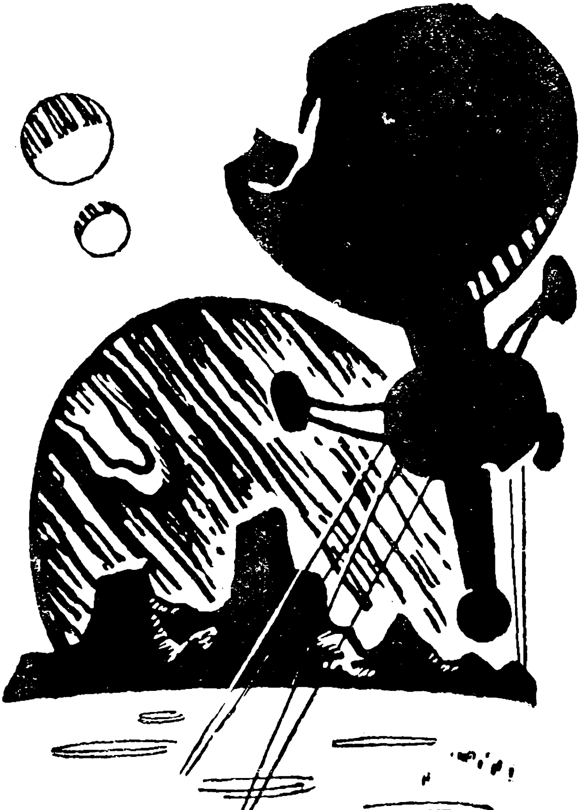
In the evening he told everything to the other woman.

DESTINATION: AMALTHEIA



by

Arkady and Boris Strugatsky



Arkady and *Boris Strugatsky,* authors of "Destination; Amaltheia", have already several collections of SF stories to their credit. Arkady Strugatsky (b. 1925) is a linguist and translator specialising in Japanese. Boris (b. 1933) is an astronomer and works at the computer laboratory of Pulkovo Observatory. The title story of this volume is their second novelette appearing after "The Country of the Purple Clouds" —about explorations on Venus, First Prize winner in a best SF book competition.

Jupiter, Saturn, Uranus, Neptune. . . Hydrogen phantoms, the strangest and most enigmatic objects in the solar system. Enormous masses of hydrogen and helium tinged by methane and ammonia. What is their structure? What makes them rotate at such a frantic .speed? What is their source of energy? We observe titanic changes on their surface. We see strips of clouds streak along, broken now and then by giant whirls, streamers of gases erupt into space in flaring bursts. What forces are behind these outer phenomena? Thermonuclear reactions? But these giants have sub-zero surface temperatures: —216°F on Jupiter and even lower on the others. What is then the mechanism of these primaries? Perhaps it is some physical principle we don't know yet and even do not so far dare to guess at....

PROLOGUE

J-STATIQN, AMALTHEIA

The chief of J-Station enjoys the sight of rising Jupiter while the nutrition engineer bewails the shortage of canned food.

Amaltheia makes one full rotation on its axis in about thirty-five hours. But it takes only twelve hours to complete its orbit round Jupiter. That is why the enormous shapeless hump of Jupiter rears in close view every thirteen and a half hours. And that is a spectacular sight. But to see it at all you have to take a lift to the spectrolite-domed top floor. When your eyes get accustomed to the darkness outside you begin to make out an ice-bound plain receding to the serrated mountain range on the horizon. The sky is black and studded with bright unblinking stars. These shed a faint light on the plain, the mountain range a pitch-black gap in the starry sky. But if you look long enough you will make out the jagged tops. Sometimes Ganymede's mottled crescent or Callisto's silver disc—or more rarely both—will come out and hang above the range. Then on the plain grey fingers of shade stretch from end to end across the gleaming ice.

And when the Sun is a small ball of blinding fire above the horizon the plain turns blue, the shadows black and every crack or hump stands out in stark relief. Coal-black spots on the spacefield look 'like big freshly-frozen puddles and you feel like running over that thin crust of ice to hear it crunch under your magnetic boots and see it fan out in dark wrinkles.

But that is not yet really spectacular. All that can be seen in other places besides Amaltheia. It's when Jupiter rises that the sight becomes really spectacular. And it's really spectacular only when seen from Amaltheia—especially when Jupiter rises in pursuit of the Sun. It all starts with a greenish-brown glow—Jovian exosphere— gaining in intensity behind the rugged peaks. As it grows brighter it extinguishes one by one the stars that the Sun has not been able to obscure and spreads across the black sky, slowly closing in on the Sun itself, which it suddenly engulfs. That is a moment not to miss. That is a moment when, as if at a flourish of a magic wand, the greenish-brown glow turns instantaneously blood red. You tense for it and yet it always catches you unprepared. The Sun turns red and the ice-bound plain turns red and the small dome of the radio-beacon starts sending off blood-red reflections. Even the shadow the mountaintops throw turns pink. By and by the red darkens, turns brownish and then, at last, the enormous brown hump of Jupiter rolls into view over the rugged peaks. The Sun is still visible and red, red-hot as molten metal, like a round disc against a brownish-red backdrop. For some obscure reason this brownish red is classed as an unattractive colour. People who are of this opinion must never have watched Jupiter rise in pursuit of the Sun, never have seen the brownish-red glow across half the sky with the clear-cut red disc superimposed on it. Then the disc disappears. Only Jupiter remains, huge, brown, shaggy. It has taken its time crawling over the horizon as if swelling, and now fills a full quarter of the sky. Black and green belts of ammonia cloud criss-cross the planet. That too is beautiful. Unfortunately you can seldom watch the sight till that stage. There is work to be done. When you are on observation duty you see the sight in toto, of course, but then you don't look for beauty....

The head of J-Station looked at his watch. The Jupiter-rise today promised to be as spectacular as ever but it was time he went below to his office to do some hard thinking. In the shadow of the cliffs the trellis-work skeleton of the Big Antenna stirred and began unfolding. The radio astronomers were about to start observations. The hungry radio astronomers.

The chief threw a final glance at the brownish-red brumous dome of Jupiter swelling over the range and thought he would like some day to catch all the four big satellites above the horizon with Jupiter in the first quarter, half orange, half brownish red. Then it occurred to him he had never seen Jupiter setting. That must be quite a sight too—the exospheric glow dying out and the stars flickering up one after another in the darkening sky like diamond needles against black velvet. But usually Jupiter-set is the peak of the working day.

The chief entered the lift and dropped down to the bottom floor. The station was fairly big and occupied several tiers hacked through the solid ice and encased in plastic metal. Fifty-three people manned it. Fifty-three hungry men and women.

The chief glanced into the recreation rooms as he went along but found them empty save for the spherical swimming pool where someone was splashing about, the room echoing to the sound. The chief went on stepping unhurriedly in his heavy magnetic boots. There was next to no gravity on Amaltheia and that was highly inconvenient. People got accustomed to it, of course, but at first they all felt hydrogen-filled and any moment likely to burst out of their magnetic footgear. Sleeping in particular had cost them all a lot of getting accustomed to.

Two astrophysicists, hair wet after a shower, overtook him, said hullo and passed on to the lifts. Something was wrong with the magnetic soles of one of them, for he was dancing and swaying awkwardly as he tried to keep pace with the other. The chief turned into the canteen, where about fifteen people were still having their breakfast.

Uncle Hoak, the station's nutrition engineer, was himself serving the breakfasts on a trolley. He was gloomy. Not that he was of a sunny disposition ordinarily. But today he was definitely gloomy. As a matter of fact so had he been the day before and the day before that—indeed ever since that unfortunate day when the radio message about the food disaster came from Callisto. J-Station's foodstores on Callisto had been invaded by a fungus. That had happened before, but this time the stores were destroyed completely, to the last biscuit, and so were the chlorella plantations.

Life was hard on Callisto, for no means of keeping the fungus out of the quarters had yet been found. It was a remarkable fungus. It penetrated any wall and demolished any kind of food. It just gobbled up chlorella. Sometimes it attacked men but it was not dangerous. At first people were afraid of it and the bravest flinched discovering on their hands the characteristic grey-coloured slimy film. But there was no pain or after-effects. Some even claimed the fungus was a good tonic.

"Hey, Uncle Hoak," somebody shouted. "Are we going to have biscuits for dinner as well?"

The chief did not notice who it was, for everyone in the canteen immediately turned their faces to Uncle Hoak and stopped eating. Nice young faces, deeply tanned almost all of them. And already drawn a little. Or was he imagining things?

"You will have soup for dinner," said Uncle Hoak.

"Ripping," somebody said, and again the chief didn't notice who.

He sat down at the nearest table. Hoak wheeled up the trolley and deposited a breakfast on the table—two biscuits on a plate, half a bar of chocolate and a squeeze bottle of tea. He did it in his usual smart way but the thick white biscuits jumped up all the same and hung above the table. The bottle stood firm however, held in place by a magnetic rim round the bottom. The chief caught one of the biscuits, took a bite and touched the bottle. The tea was cold.

"Soup," said Hoak. He was speaking in a low voice—just for the chief. "You can imagine what kind of soup. And they think I'm going to serve them chicken broth." He pushed the trolley away and sat down at 'the table. He watched the trolley run down the aisle slower and slower. "Incidentally they're still enjoying chicken broth on Callisto."

"I don't think so," the chief said absent-mindedly.

"But they are," said Hoak. "I gave them one hundred and seventy cans—more than half of our iron rations."

"And we've finished what was left?" "Yes, of course."

"Well, they must have finished theirs too," the chief said, munching his biscuit. "They've got twice as many people as we have."

I don't believe you. Uncle Hoak, he thought. I know you, nutrition engineer. You surely have another two dozen or so cans tucked away somewhere for the sick and just in case.

Hoak sighed and said, "Your tea's gone cold? Let me refill...."

"No, thank you."

"Chlorella's still not taking on Callisto," Hoak said and again sighed. "They've radioed again, asking for another twenty pounds of culture. Sent a rocket for it, they said."

"Well, we must give it to them."

"That's all right," said Hoak. "But who will give us any? As if I had a hundred tons... it takes time to grow. But I'm spoiling your appetite."

"Never mind," said the chief. He had no appetite anyway.

"Enough of this!" someone said. The chief looked up and saw the embarrassed face of Zoya Ivanova. Next to her sat the nuclear physicist Kozlov. They always sat together.

"Enough, d'you hear!" Kozlov said hotly.

Zoya flushed and lowered her head. She was visibly disconcerted to find herself the centre of general attention.

"You slipped your biscuit on to my plate yesterday," said Kozlov. "Today you're up to it again."

Zoya was silent and on the verge of tears.

"Don't yell at her, you baboon!" Potapov bawled from the far end of the canteen. "Zoya dear, why d'you have to feed that brute? You'd do much better giving it to me. I'd eat it. And I wouldn't yell at you."

"No, really," Kozlov said in a calmer voice. "She needs more than a healthy fellow like me."

"Stop it, Valya," Zoya said without raising her head.

"Can I have some more tea, Uncle Hoak?" somebody asked.

Hoak got up. Potapov bawled out again:

"Hey, Gregor, care for a game after the knock-off?"

"I don't mind."

"You'll get licked again, Vadim," a voice said.

"The theory of probability's on my side!"

Potapov bawled.

There was general laughter. "The law of high magnitudes is on mine!" A face crumpled with sleep looked in through the door.

"Potapov here? Vadim, there's a storm on Jupe!"

"You don't say so," Potapov said, jumping up.

The face disappeared, then popped into view again:

"Get my biscuits for me, will you."

"Hoak won't give us them," Potapov answered the retreating figure and glanced at Uncle Hoak.

"Why not?" said Hoak. "Konstantin Stetsenko, half a pound of biscuits and two ounces of chocolate. He's entitled to it."

The chief rose, wiping his mouth with a paper serviette. Kozlov said:

"Comrade chief, any news of the *Tahmasib?"*

All present fell silent and turned their faces to the chief. Deeply-tanned young faces, already drawn a little. The chief replied:

"No news."

He walked slowly down the aisle and to his office. The trouble was that the "fungus invasion" that had struck Callisto was highly inopportune. It wasn't starvation yet. But if Bykov did not arrive with the food.... Bykov was somewhere not far away, in fact he had already been located but had ceased reporting since and had not been heard for sixty hours now. We must cut the rations again, thought the chief. Anything could happen and their base on Mars was a long way off. Anything could happen here. Spaceships from Earth and from Mars had disappeared before. It doesn't happen often, not oftener than the fungus invasions. But it's bad enough that it does happen at all. It's a nuisance.

CHAPTER ONE

THE CARGO PHOTON ROCKET "TAHMASIB"

1. The spaceship approaches Jupiter while her captain has a row with the navigator and takes sporamin.

Alexei Petrovich Bykov, captain of the cargo photon rocket *Tahmasib,* emerged from his cabin and carefully closed the door behind him. His hair was wet and well brushed. The captain had just had his shower. As a matter of fact he'd had two showers—one of water and one of ions—but he still wanted to sleep so badly that his eyes would not stay open. Over the last three days and nights he had not slept for more than five hours in all. The flight was not proving easy.

The gangway was bare and light. Bykov headed for the control room, making an effort not to shuffle, shaking off the stupor of a short nap he'd just had. His way lay through the mess. Its door stood open and through it Bykov thought he heard quarrelsome voices. They belonged to the planetologists Dauge and Yurkovsky and sounded strained and unusually muffled. Up to something again, those two, thought Bykov. No peace from them. It's not easy for me to give them a ticking off either. After all, they're my friends and jolly glad to be all together on this flight, It's not go often we get the chance.

Bykov stepped into the mess room and stopped dead, his foot on the coaming. The bookcase was open, the books lying in an untidy heap on the floor. The table-cloth was awry. Sticking from under the sofa were Yurkovsky's long legs sheathed in grey drainpipes. The legs were jerking excitedly.

"She's not here, I tell you," said Dauge. He himself was not in sight.

"You go on looking for her," Yurkovsky's muffled voice was heard. "No backing out now."

"What's going on here?" Bykov enquired sternly.

"Ah, here he is," Dauge said, crawling out from under the table. His face was pleasurably animated, his jacket and the collar of his shirt unbuttoned. Yurkovsky backed on all fours from under the sofa.

""What's the matter?" said Bykov.

"Where's my Varya?" Yurkovsky asked, getting up. He was angry.

"The monster!" Dauge exclaimed.

"You loafers," said Bykov.

"It's him," Dauge said in a tragic voice. "Just look at his face, Vladimir! The butcher!"

"I'm quite serious, Alexei," said Yurkovsky. "Where's my Varya?"

"I'll tell you what, planetologists," said Bykov. "Enough of your monkey tricks."

He thrust his jaw at them and strode across to the control room. Dauge said after him:

"He's burnt Varya in the reactor."

Bykov banged the hatch shut behind him.

It was quiet in the control room. In his usual place at the computer sat the navigator, Mikhail Antonovich Krutikov, his double chin propped on his plump fist. The computer was clicking faintly, staring away with its neon pilot lamps. Mikhail Antonovich raised his kind little eyes to the captain and asked:

"Had a good sleep, Alexei old chap?"

"Yes," said Bykov.

"I've received bearing signals from Amaltheia," said Mikhail Antonovich. "They're waiting for us. Oh, how they're waiting for us," and he shook his head. "They're on rations: half a pound of biscuits and two ounces of chocolate. Just imagine. And a plate of chlorella broth. That's another three-quarters of a pound. And such unpalatable stuff...."

You should be there, fatty, thought Bykov. You'd slim down fast. He threw a stern glance at the navigator but couldn't keep it up and grinned. Mikhail Antonovich, his thick lips pouted worriedly, was examining a chart traced on light-blue paper.

"Here, Alexei," he said. "I've compiled the finish-programme. Please check it."

There was no point usually in checking course programmes drawn up by Mikhail Antonovich. He was still the fattest and most experienced navigator in the space fleet.

"I'll check it later," said Bykov. He yawned drowsily, cupping his mouth with a hand. "Feed it into the cyber-navigator, will you."

"I have," Mikhail Antonovich said guiltily.

"Oh," said Bykov. "Good. Where're we now?"

"In an hour's time we begin the finish part of it," said Mikhail Antonovich. "We'll pass over Jupiter's north pole," he pronounced the word "Jupiter" with visible relish, "at a distance of two diameters, about one hundred and eighty thousand miles. Then for the last spiral. We may consider we're already there, old chap."

"You calculated the distance from Jupiter's centre?"

"Yes."

"When we begin the finish, report the distance from the exosphere every quarter of an hour."

"O.K."

Bykov yawned again, rubbed his sore, sleepy eyes vexedly and passed on to the alarm system panel. Everything was in order there. The propulsion plant operated normally, the plasma was injected as required, the tuning of the magnetic traps was kept very tight. The magnetic traps were the responsibility of Engineer Ivan Zhilin. Good for you, Zhilin, thought Bykov. First-class tuning for a raw hand.

Bykov halted and tried, by slightly changing the course, to break the tuning. It held. The white spot behind the translucent plastic would not even waver. Good for you, Zhilin, Bykov thought again. He went round the bulging bulkhead—the photon reactor casing. At the reflector control combine stood Zhilin, his pencil between his teeth. He was leaning over the control panel, his hands on its edge, tap-dancing almost imperceptibly, his powerful shoulder-blades moving on his bent back.

"Hello, Vanya," said Bykov.

"Hello, Alexei Petrovich," Zhilin said, whirling round. The pencil slipped from his teeth and he caught it smartly in mid air. Zhilin was twenty-three years old, just out of the High School of Cosmogation.

"How's the reflector?" asked Bykov.

"The reflector's in order," said Zhilin, but Bykov leaned over the control panel all the same and pulled at the hard, blue tape of the recorder.

The reflector, or the sail, as it is also called, is the principal and most fragile part of a photon rocket. It is a gigantic parabolic mirror, coated with five layers of superhard mesosubstance. Every second thousands of portions of the deuterium-cum-tritium plasma explode at the focus of the parabola and are transformed into radiation. The pallid lilac flame hits the surface of the reflector and creates thrust. As this goes on the mesosubstance is subjected to tremendous changes in temperature and gradually burns away, layer by layer. Besides, the reflector is eaten away by meteoric corrosion. And if, when the propulsion unit was on, the reflector were to collapse at the base where it is joined by the thick tube of the photon reactor, the ship would go in one silent flash. To avoid this the reflectors of photon ships are replaced after every hundred astronomical units of flight. And this also is why a control system is constantly checking on the working layer all over the reflector's surface.

"Well," Bykov said, examining the tape. "The first layer's burnt away."

Zhilin didn't say anything.

"Mikhail," Bykov called out to the navigator. "Did you know the first layer was burnt out?"

"Yes," the navigator said. "It can't be helped. We're doing on oversun, aren't we."

An "oversun", or a "leap over the Sun", *is* resorted to rarely, in cases of emergency like this, when the J-Stations were struck by hunger. In an oversun the Sun is between the start-planet and the finish-planet—which is highly unadvantageous from the point of view of "direct cosmogation". In an oversun the photon propulsion unit operates at extreme conditions, the ship's speed is of the order of four thousand miles per second and the instrumentation starts showing the effects of non-classic mechanics, which we still do not know enough about. The crew has to make do with very little sleep, plasma and reflector consumption is enormous and on top of it all the ship as a rule approaches the finish-planet from one of the poles, which makes landing tricky.

"Yes," said Bykov. "An oversun, that's just it."

He went back to where the navigator sat and looked at the plasma consumption dial.

"Give me a copy of the finish-programme, Misha," he said.

"Just a second," said the navigator.

He was having a busy time of it. Sheets of light-blue paper were scattered on the desk in front of him, a semi-automatic computer attachment was whirring in an undertone. Bykov sank down in a chair and half-shut his eyes. Vaguely he saw Mikhail Antonovich reach a hand out to the panel without taking his eyes off his notes and quickly run his fingers along the keys. His hand looked like a large white spider. The computer gave a louder whirr, then switched off with a flicker of the stop lamp.

"What was it you wanted?" the navigator asked, still deep in his notes.

"The finish-programme," Bykov said, opening his eyes with an effort.

A tabulator tracing snaked out of the output device and Mikhail Antonovich snatched at it with both hands.

"Half a sec," he said hurriedly. Bykov's ears rang and yellow lights danced in front of his eyes. His head sank on to his chest.

"Alexei," said the navigator. He reached across his desk and tapped Bykov on the shoulder. "Here's the programme."

Bykov started, jerked up his head and looked around. Then he took the sheets of figures.

"Hm, hm," he said, the skin moving in waves on his forehead. "Well. A theta-algorithm again..." and he stared sleepily at the notes.

"Why don't you take some sporamin?" said the navigator.

"Wait," said Bykov. "Wait. What's this? Are you crazy, navigator?"

Mikhail Antonovich jumped up, ran round the desk and leaned over Bykov's shoulder.

"Where, where?" he asked.

"Where do you think you're going anyway?" Bykov enquired bitingly. "D'you think you're going to the Seventh Testing Grounds?"

"But what's the matter?" the navigator asked.

"Or do you think they've built a tritium generator for your private use on Amaltheia?"

"If you mean the propellent," said Mikhail Antonovich, "there's enough of it for three such programmes. ..."

Bykov was wide awake now.

"I'm touching down on Amaltheia," he said. "Then I'm making a round trip with the planetologists inside the exosphere. And then I go back to Earth. Which means another oversun!"

"Wait," said Mikhail Antonovich. "Just a moment...."

"And here you're drawing up a crazy programme: for me as though there were stores of propellent waiting for us."

The door was pushed ajar. Bykov turned to look. Dauge's head was squeezed into the crack. The eyes swept round the control room and his voice implored:

"I say, boys, isn't Varya here?"

"Get out!" Bykov snarled.

The head vanished. The door was closed carefully.

"The loafers," said Bykov. "Listen here, navigator. I'll get the propellent for the return oversun by melting down your gammon." ,

"Don't shout," Mikhail Antonovich said indignantly. He thought a moment and added, red-faced, "Damn it."

A silence descended. Mikhail Antonovich returned to his place and they sat glowering at each other across the desk.

"The leap into the exosphere is calculated. The return oversun is nearly finished," he placed a pudgy hand on the heap of papers on the desk. "But if you've got cold feet we can easily refuel on Antimars...."

That was the cosmogators' name for an artificial planet that moved almost in the Martian orbit on the other side of the Sun. It was just a huge store of propellent, a fully automated refuelling station.

"And I don't see why you should bawl at me," said Mikhail Antonovich. The word "bawl" he said in a whisper. Mikhail Antonovich was cooling down. So was Bykov.

"All right," he said. "Sorry, Misha." Mikhail Antonovich smiled readily. "I shouldn't have gone off the deep end 'like that," said Bykov.

"Oh, it's all right, old fellow," Mikhail Antonovich was saying hurriedly. "Nothing to bother about. ... Just look what a perfect spiral it will make. From the vertical," his hands followed his thoughts, "into the plane of Amaltheia's orbit just above the exosphere and then a free-coasting path to the rendezvous. At the rendezvous the relative velocity will be a mere thirteen feet per second. The maximum G-load will be only twenty-two per cent and weightlessness will only last thirty to forty minutes. And there should only be a slight margin of error."

"It should be slight because it's a theta-algorithm," said Bykov. He wanted to say something pleasant to the navigator: it was Mikhail Antonovich who had first developed and used the theta-algorithm.

Mikhail Antonovich uttered a vague sound. He was pleasantly embarrassed. Bykov finished looking through the programme, nodded several times and, putting the sheets aside, rubbed his eyes with his huge freckled fists.

"Tell you frankly," he said, "I've had a rotten sleep."

"Take some sporamin, Alexei," Mikhail Antonovich said persuasively. "Look at me—I take a tablet every two hours and don't feel like sleep at all. So does Vanya. Why should you torture yourself?"

"Hate the stuff," said Bykov. He grunted, jumped up and paced the room. "Look here, Misha," he said. "What's happening on board my ship anyway?"

"What do you mean?" the navigator asked.

"Those planetologists," Bykov explained.

From behind the casing Zhilin said:

"Varya's disappeared."

"You don't say so," Bykov said. "Good riddance." He paced the room again. "The loafers," he said. "Middle-aged kids."

"Don't be too hard on them, old chap," said the navigator.

"You know," Bykov said as he sank back into his chair, "you know the worst that can happen to you in flight is passengers. And the worst passengers are your old friends. I guess I'll have some of that sporamin after all, Misha."

Hastily, Mikhail Antonovich pulled a small box out of his trouser pocket. Bykov watched him do it with sleepy eyes. .

"Give me two tablets," said he.

2. The planetologists look for Varya while the radio astronomer finds what a hippo is.

"He told me to get out," Dauge said, returning to Yurkovsky's cabin. His host was standing on a chair in the middle of the cabin, feeling with his hands the soft mat ceiling. The remains of a squashed sugar cake were scattered on the floor. "It means he's got her," said Yurkovsky. He jumped off the chair, brushed white crumbs off his knees and called out plaintively:

"Varya, my love, where're you?" "Have you tried sitting on a chair all of a sudden?" asked Dauge. He went up to the sofa and let himself drop on it rod-like, his arms pressed to his sides.

"You'll kill her!" Yurkovsky cried. . "She's not here," Dauge informed him and settled more comfortably,.. hoisting his feet on to the back of the sofa. "This is .just what you must do to all the sofas and chairs in the place. Varya likes them soft."

Yurkovsky dragged his chair nearer to the wall.

"No," he said. "When flying she likes to climb on ceilings and walls. I ought to make a round of the ship and try all the ceilings."

"Good Lord," Dauge sighed. "What won't enter a browned-off planetologist's head." He sat up, glanced at Yurkovsky out of the tail of his eye and whispered ominously: "I'm certain it's Alexei. He's always hated her."

Yurkovsky looked at Dauge closely.

"Yes," Dauge went on. "He always has. And you know it. What did she do to him? She was always so nice and quiet...."

"You're a booby, Grigory," said Yurkovsky. "You're being funny, but I'll be really sorry if she's gone."

He sat down and propped his elbows on his knees and his chin on his balled fists. His high balding forehead became furrowed and his black eyebrows tragically arched.

"Come, come," said Dauge. "She can't disappear from aboard a ship, can she? She'll turn up."

"Turn up," said Yurkovsky. "It's time for her to eat. She never asks—she'd sooner starve."

"She won't starve herself to death, don't you fear," said Dauge.

"She's not had a bite for twelve days now—ever since the start. It's bad for her."

"When she wants some grub she'll come," Dauge said with conviction. "That is common to all forms of life."

Yurkovsky shook his head.

"Not she, she won't, Grisha," he said.

He got up and started feeling the ceiling again, inch by inch. There was a knock on the door. Then it slid softly aside and in the doorway stood short ebony-haired Charles Mollard, the radio astronomer.

"Come in?" said Mollard.

"That's right," said Dauge.

Mollard waved his arms.

"Mais - non," he exclaimed, smiling happily. He was always smiling happily. *"Non* come in. I wanted to say: may I come in?"

"Certainly," Yurkovsky said from up his chair. "Certainly you may, Charles. Why not?"

Mollard walked in, slid the door shut and craned his neck with curiosity.

"Voldemar," he said, rolling his r's exquisitely. "You learn to walk on the ceiling?"

"Out, madame," Dauge said in his execrable accent. "I mean to say monsieur, of course. Fact is *il cherche la* Varya."

"No, no," Mollard ejaculated—and waved his arms again. "Not this. Only Russian. I speak only Russian, do I not?"

Yurkovsky got down from his chair.

"Charles, have you seen my Varya?"

Mollard shook a finger at him.

"You joke," he said. "You joke for twelve days." He sat on the sofa next to Dauge. "What is Varya? I heard about Varya many times, you search for her today but I saw her not one time. Eh?" He looked at Dauge. "Is it a bird? Or a cat? Or ... er....."

"Hippo?" said Dauge.

"What is a hippo?" Mollard enquired.

"C'est a kind of *I'hirondelle,"* said Dauge. "A swallow."

"0, *I'hirondelle!* exclaimed Mollard. "Hippo?"

"Ja," said Dauge. "Naturlich:'

"Non, non," said Mollard. "Only Russian!" and he turned to Yurkovsky. "Gregoire says truth?"

"Gregoire says rubbish," Yurkovsky said angrily. "Plain rubbish."

Mollard looked at him attentively.

"You are upset, Voldemar," he said. "Can I help?"

"I don't see how, Charles. One must search-feel everything with the hands as I do...."

"Why feel?" Mollard was surprised. "You tell me how she looks. I search."

"That's just it," said Yurkovsky. "I wish I knew what she looks like."

Mollard leaned back on the sofa and covered his eyes with his hand.

"Je ne comprends pas," he said plaintively. "I do not understand. You don't know what she looks like? Or I don't understand Russian?"

"It's like this, Charles," said Yurkovsky. "She doesn't always look the same. When she's on the ceiling she's like the ceiling, when she's on the sofa she's like the sofa. ..."

"And when she's on Gregoire she's like Gregoire," said Mollard. "You always joke."

"He says the truth," Dauge interfered. "Varya constantly changes colour. Mimicry it's called. She's jolly good at mimicry."

"Mimicry with swallows?" Mollard asked bitterly.

There was a knock at the door again.

"Come in!" Mollard cried happily.

Entered Zhilin, large, ruddy-cheeked and diffident.

"Sorry to barge in like this, Vladimir Sergeyevich," he began, leaning forward somewhat.

"O!" Mollard exclaimed, with a flash of his white teeth. He was very fond of the engineer. *"Le petit ingenieur!* How's life? Good?"

"Good," said Zhilin.

"How's girls? Good?"

"Good," said Zhilin. It had become routine for him. *"Bon"*

"Excellent pronunciation," Dauge said enviously. "Incidentally, Charles, why do you always ask Vanya about girls?"

"I like girls," Mollard said earnestly. "And I always like to know how they are."

"Bon," said Dauge. *"Je vous comprends."*

"Vladimir Sergeyevich," Zhilin began again. "The captain sent me., In forty minutes we'll be at perijovian, on the edge of the exosphere."

Yurkovsky jumped up.

"Splendid," he said.

"If you're, going to observe I'm at your disposal."

"Thanks, Vanya," said Yurkovsky. Then he turned to Dauge. "Well, Grigory, strike up the march!"

"Watch out, Jupe," said Dauge.

"Les hirondelles, les hirondelles," sang Mollard.

"And I shall go and make dinner. I'm on duty today and I shall make soup. Do you like soup, Vanya?"

Zhilin had no time to answer because at that moment the ship veered sharply and he was thrown through the door, only saved from a fall by catching hold of the jamb at the last second. Yurkovsky stumbled over the stretched-out feet of Mollard lolling on the sofa, and fell on Dauge. Dauge grunted.

"Oh," said Yurkovsky. "That was a meteorite!"

"Get off me," said Dauge.

3. The engineer pays tribute to the heroes while the navigator discovers Varya.

The small observation bay was crammed chock-full with the planetologists' equipment. Dauge was squatting in front of a big shining apparatus which looked like an ancient television camera. It was called the exospheric spectrograph. The planetologists placed great hopes in it. It was brand-new—straight off assembly line—and worked synchronous with a bomb release, whose mat-black hatch took up half the space in the bay. Next to it the flat cases of bomb-probes lay stacked in light metal racks, gleaming dully. Each case housed twenty bomb-probes and weighed ninety pounds. The original idea was that the cases should be fed in automatically. But the *Tahmasib,* being a cargo rocket, was not fitted out for extensive research, and no place had been available for an automatic feeder. So the release was serviced by Zhilin.

Yurkovsky ordered:

"Load her!"

Zhilin slid the hatch open, took the nearest case, lilted it with an effort and placed it into the rectangular slit of the loading chamber. The case slid noiselessly into place. Zhilin closed the breech and said:

"Ready."

"So am I-," said Dauge.

"Mikhail," Yurkovsky called into the mike. "How soon?"

"In half an hour," they heard the navigator's husky voice. The ship veered again. The floor seemed to fall from under their feet.

"Another meteorite," said Yurkovsky. "The third."

"Rather thick," said Dauge.

Yurkovsky said into the mike:

"Mikhail, many micrometeorites?"

"Plenty, old chap," said Mikhail Antonovich.

His voice sounded worried. "Thirty per cent above mean density and still thickening...."

"Misha," said Yurkovsky. "Make checkings more often, there's a good chap."

"I'm doing three a minute as it is," replied the navigator. He said something aside. Then they heard Bykov's voice rumble in answer: "All right."

"Vladimir," the navigator called. "I'm switching to ten per minute."

"Thanks, Misha," said Yurkovsky.

The ship veered again.

"I say, Vladimir," Dauge said in an undertone. "This is no longer trivial."

Zhilin, too, was thinking it wasn't trivial. He couldn't remember reading anywhere in textbooks or in space charts anything about high meteoric density in Jupiter's immediate vicinity. But then few people had been in Jupiter's immediate vicinity, and most of those who had, hadn't come back to report. For this meant storming Jupiter, not just skirting it.

Zhilin perched on the plate of the hatch and glanced at his watch. Only twenty minutes to the perijovian. In twenty minutes Dauge would fire the first stick. The explosion of a stick of bomb-probes was a marvellous sight, he said. The year before he'd studied the atmosphere of Uranus with just such bomb-probes. Zhilin turned to look at Dauge. He was squatting in front of the spectrograph, his hands on the turn-lever, lean, swarthy, sharp-nosed, with a scar on his left cheek. He would crane his long neck every now and then, looking into the eyepiece of the viewer first with one eye, then with the other, and every time an orange spot of light would flicker across his face. Then Zhilin looked at Yurkovsky. He was standing, his face close to the periscope, shifting impatiently from foot to foot. The many-faceted egg of the mike dangled from his neck on a dark tape. Dauge and Yurkovsky, the well-known planetologists....

Just a month back it was that Chen Run, deputy chief of the High School of Cosmogation, had summoned graduate Ivan Zhilin.

Chen Kun was known as Iron Chen among space flyers. He was past fifty but looked quite young in his navy-blue jacket with turn-down collar. He would have been quite handsome, too, but for the pinkish-grey patches on forehead and chin—reminders of an old ray stroke. He told Zhilin that the Third Department of the State Committee for Space Flights was in urgent need of a good relief engineer and that the School Council had decided to recommend him, graduate Zhilin (at this graduate Zhilin tingled with excitement: all those five years he'd been fearing they would send him on lunar routes on probation). Chen Kun said it was a great honour for a graduate to be given as his first assignment a job on board a ship flying oversun to Jupiter (graduate Zhilin nearly jumped with joy), carrying provisions for a J-Station on Amaltheia, Jupiter's fifth satellite. Amaltheia was facing hunger, said Chen Kun.

"What's more," said Iron Chen, "you will have as your commander the renowned space flyer, Alexei

Petrovich Bykov—also a graduate of our School. With him and senior navigator Mikhail Antonovich Krutikov—a man of vast experience, you will go through a first-rate practical school and I must say I am very glad for you."

That Grigory Dauge and Vladimir Yurkovsky were going too Zhilin learnt later, already on the Mirza-Charle spacedrome. What names! Yurkovsky and Dauge, Bykov and Krutikov, Bogdan Spitsin and Anatoly Yermakov. Since his childhood he had known the legend, beautiful yet frightening, that had been woven round the names of that handful of men who had conquered a formidable planet for mankind. He thought of them now, of the men who on an antediluvian *Hius*—a photon tub with a single layer of mesosubstance on the reflector—pierced the Venusian atmosphere and in the primordial black sand-wastes discovered a uranium Golconda— the spot where a mammoth meteorite of anti-substance had hit the planet.

Zhilin knew other remarkable spacemen of course. For instance, the test flyer Vasily Lyakhov who had lectured on the theory of photon propulsion to the third- and fourth-year students. He organised a three-month practical course on Spu-20 for last-year students. Space flyers called Spu-20 the Starlet, and Zhilin found it fascinating. The first ram photon engines were tested there; robot scouts were sent from there into the zone of absolute free fall; the first astroship *Hius-Lightning* was being built there. One day Lyakhov took the students into a hangar. In it was a photon robot refueller which had just returned from a six-month wandering in the AFF zone. The robot had travelled away from the Sun to a distance of one light-month. It was a huge ungainly job of a surprising turquoise-green colour. The sheeting fell away in pieces when they touched it. It just crumbled away as dry bread would. But its controls were in working order, or it wouldn't have returned—like three scouts out of the nineteen sent out into the AFF zone. The students wanted to know what had happened to the robot but Lyakhov said he didn't know. "At great distances from the Sun there's something we still don't know anything about," he said. And his thoughts turned to the men who in a few years' time would steer the *Hius-Lightning* to that region where there was something about which we didn't know anything.

Funny, thought Zhilin, I already have quite a few things to remember myself. Take that time, for instance, on a practice flight in a geodesic rocket when the engine cut dead and I plopped down with my rocket in a state-farm field near Novoyeniseisk. I wandered among the automatic HF ploughs for hours until by the evening I came across a remote control man. That night we lay in his tent watching the lights on the ploughs traverse the dark field, and when a plough chugged by, whiffs of ozone wafted to us. The man plied me with local wine and chafed me and, I still think I left him unconvinced that space flyers do not drink. In the morning a tractor-haul came for the rocket. Iron Chen gave me a rocket, too, for failing to catapult....

Or my diploma Spu-16 Earth-Giphei Moon flight when a member of the examination panel tried to confuse us by yelling the input data in a panicky voice: "Asteroid, third magnitude, on the starboard! Rate of enclosure twenty-two!" and the like. There were six of us and we were all sick and tired of the chap, though Jan, the monitor, tried to persuade us people should be forgiven their small weaknesses. We agreed in principle but couldn't forgive that particular weakness. We all thought it was a clueless flight and none of us felt any fear when suddenly the ship went into a terrific bank under 4 G's. We scrambled into the control room, where the member of the panel was pretending the overgravity had killed him, and righted her. Then the man opened one eye and said, "Good show, space flyers," and we forgave him all his weaknesses there and then. Before him nobody had called us that in earnest, except our mothers and girl friends, but when saying, "My dear space flyer," they had a look as though they were about to burst into tears.

At that moment the *Tahmasib* was shaken with such a force that Zhilin fell backwards, knocking his head against the bomb-rack.

"Damn," said Yurkovsky. "It may be untrivial but if the ship's going to yaw like that we won't get much work done."

"No," said Dauge, his hand pressed to his right eye, "indeed we won't."

Apparently there were more and more large meteorites straight ahead and the cyber-navigator, on orders from the overworked meteorite finders, was jerking the ship crazily out of their paths.

"Surely not a swarm?" Yurkovsky said, clutching at the periscope frame. "Poor Varya, she doesn't like being shaken."

"Why didn't you leave her behind then?" Dauge said viciously. His right eye was swelling visibly; he fingered it, muttering something in Lettish. He was no longer squatting, but half-lying on the floor, his legs spread for better balance.

Zhilin stood upright, gripping with each hand the breech and the bomb-rack for support. Suddenly the floor fell from under his feet, then rushed up, hitting his heels painfully. Dauge groaned. Zhilin's legs buckled. Bykov's hoarse bass roared on the intercom:

"Engineer Zhilin to control room! Passengers take shelter in the acceleration absorbers!"

Zhilin raced, rolling, to the door. Behind his back Dauge said:

"Why in the absorbers?"

"Nothing doing," said Yurkovsky. Something metallic rattled across the floor. Zhilin dashed into the gangway. There was adventure coming.

The ship was being tossed about like flotsam on choppy seas. Zhilin ran along the gangway in a forced zigzag, thinking; That one's past, and that, and that too, they'll all go past.... Then there was a sharp hissing behind him, incredibly loud. He backed against the wall and spun round. In the empty gangway ten paces away there was a dense cloud of white vapour exactly like that which is observed when a bottle of liquid helium bursts open. The hissing soon stopped. The air was icy-cold. "Hit us, the bastard," Zhilin said and tore himself from the wall. The white cloud crept after him, slowly settling.

It was very cold in the control room, and Zhilin saw rainbow-coloured hoarfrost on the walls and the floor. Mikhail Antonovich, his neck purple, sat at the computer, reading a tape. Bykov was not in sight.

"Another hit?" the navigator called in a thin voice.

"Where the dickens is that engineer?" Bykov boomed from behind the casing.

"Here," said Zhilin.

He ran across the control room, which was slippery with hoarfrost. Bykov popped out to meet him, his red hair standing on end.

"To the reflector control," he said.

"Aye, aye," said Zhilin. "Navigator, any gaps?"

"No. Same density all round. Bad luck...." "Cut off the reflector. I'll try to get through on the emergency engines."

Mikhail Antonovich swivelled hurriedly in his chair to the control panel behind him. He put his hand on the keyboard and said:

"Perhaps we could—"

He did not finish. Terror distorted his face. The panel with the keyboard bent, then straightened again and slid noiselessly to the floor. Zhilin heard him scream and ran in confusion from behind the casing. On the wall, clutching .at the soft panelling, sat Varya, Yurkovsky's pet, a five-foot-long Martian lizard. The exact replica of the control panel was already fading off her body, but on her horrible triangular muzzle, a red hold lamp was still flickering, on and off. Mikhail Antonovich stared at the patterned monster, sobbing and holding his hand to his heart.

"Shoo!" Zhilin yelled; Varya darted aside and disappeared.

"I'll kill her," Bykov growled. "Zhilin, to your station, damn it."

Just as Zhilin was turning the *Tahmasib* was hit real hard.

J-STATION, AMALTHEIA

The water-carriers talk about hunger while the nutrition engineer is ashamed of his cuisine.

After supper Uncle Hoak entered the rest-room and said, without looking at anyone:

"I need some water. Any volunteers?"

"Yes," said Kozlov.

Potapov looked up from the chess-board and also said yes.

"Why, yes," said Kostya Stetsenko.

"May I come too?" Zoya Ivanova asked in a thin voice.

"You may," Uncle Hoak said, staring at the ceiling. "So I'll be waiting for you."

"How much water do you need?" asked Kozlov.

"Not much," said Uncle Hoak. "About ten tons."

"Right-o," said Kozlov. "We're going straight away."

Uncle Hoak went out.

"I'll go with you," said Gregor.

"You better stay behind and think over your next move," Potapov advised. "It's your turn. You always take half an hour over every move."

"Never mind," said Gregor. "I'H have time enough to think."

"Galya, will you go with us?" asked Stetsenko.

Galya was reclining in a chair in front of the magnetovideophone. She lazily responded:

"I don't mind."

She stood up and stretched luxuriously. She was twenty-eight years old, tall, dark and handsome. The most beautiful woman of the station. Half of the boys were in love with her. She was in charge of the astrometrical observatory.

"Come on," Kozlov said, buckling on his magnetic boots and making for the door.

They first called at the, stores for fur jackets, electric saws and a self-propelled platform which was to take them to the Ice Grotto. That was the name by which the place where the station got water for all its needs was known. Amaltheia—a somewhat flattened sphere with a diameter of eighty-two miles—is completely composed of ice. It is ordinary water ice, the same as on the Earth, only its surface is sprinkled with meteoric dust and fragments of rock and iron. There was no lack of explanations of this ice planet's origin. Some people with little knowledge of cosmogony believed that it was the water envelope of some planet which had neared Jupiter closer than was good for it and got it torn off its back; others were inclined to explain the fifth satellite as a result of the condensation of water crystals; still others claimed that Amaltheia did not belong to our galaxy at all, but had wandered out of interstellar space and been captured by Jupiter. But anyway, an unlimited store of water ice, theirs for the hacking, came in very handy to the station's personnel.

The platform ran the length of the bottom tier and stopped in front of the wide gate of the Ice Grotto. Gregor jumped down, went up to the gate and, screwing his eyes short-sightedly, searched for the button lock.

"Lower, lower, you blind owl," said Potapov.

Gregor pressed the button and the gate slid open. The platform ran inside. The place did look like an ice grotto, a tunnel hacked in solid ice. It was lit by three gas-filled tubes, whose light was reflected sparkling from the walls and ceiling, the whole giving the effect of a many-chandeliered ball-room.

There was no magnetic floor, which made walking difficult, and it was intensely cold.

"Ice," said Galya, looking round her. "Just like back on the Earth."

Zoya shivered, pulling her fur jacket tighter round her.

"Looks like Antarctica to me," she muttered.

"I've been to Antarctica," Gregor declared, "Where haven't you been!" said Potapov. "You've been everywhere."

"Come on, boys, let's start," Kozlov ordered. The boys took the saws, went to the far wall and started sawing blocks of ice. The saws went into the ice like hot knives into butter. Ice sawdust sparkled in 'the air. Zoya and Galya came closer.

"Let me have a go," Zoya asked, looking at Kozlov's bent back.

"No," he said without glancing back. "It'll hurt your eyes."

"Just like snow back on the Earth," Galya said, placing her hand in the stream of ice dust.

"Plenty of that stuff anywhere," said Potapov. "Take Ganymede—any amount of snow there." "I've been to Ganymede," Gregor declared. "You'd drive anyone mad," said Potapov. He switched off his saw and pushed a cube of ice weighing at least a ton away from the wall. "There you are."

"Cut it in pieces," advised Stetsenko. " ' ‴ "No, don't," said Kozlov. He, too, switched off his saw. "On the contrary," and he gave his huge block of ice a strong push so that it glided slowly towards the exit. "On the contrary—-it's easier for Hoak when the blocks are large."

"Ice," said Galya. "Just like on the Earth. I think I'll be coming here often after work now."

"Are you missing the Earth very much?" Zoya asked timidly. She was ten years younger, worked as assistant at the astrometrical observatory and felt shy in front of her chief.

"Yes," said Galya. "Missing the Earth in a general way, Zoya darling, but above all longing to sit on grass, stroll in a park, go to a dance.... Not our airy exercises but an ordinary waltz. And to drink out of ordinary glasses instead of those stupid squeezies. And wear a dress instead of trousers, I'm missing an ordinary skirt terribly."

"So am I," said Potapov.

"Nothing like a bit of skirt," said Kozlov.

"You wits," said Galya.

She picked up a piece of ice and threw it at Potapov. Potapov jumped out of its way, hit the ceiling and bounced back on Stetsenko.

"Easy there," Stetsenko said angrily. "Or you'll get sawn in two."

"Looks like enough," said Kozlov. He had just heaved off a third block. "Load up, boys."

They loaded the ice on to the platform, then Potapov seized Galya with one arm and Zoya with the other and without warning tossed both on top of the neat pile of ice blocks. Zoya gave a little shriek and clutched at Galya. Galya laughed.

"Come on," Potapov yelled. "There'll be a bonus from Hoak—a plate of chlorella soup each."

"I won't be the one to turn it down," Kozlov muttered.

"You've never turned a plate of soup down yet," said Stetsenko. "Still less now when we're hungry.. . ." The platform rolled out of the Ice Grotto and Gregor closed the gate.

"Hungry, did you say?" Zoya contributed from high up the ice mound. "Why, I read a book about the war with the fascists the other day— people were really hungry then. In Leningrad when it was besieged."

"I've been to Leningrad," declared Gregor.

"We get chocolate," Zoya went on, "and they were issued five ounces of bread a day. And what bread! Sawdust—half of it."

"Not sawdust, really," said Stetsenko.

"But it was."

"Chocolate or no chocolate," said Kozlov, "we'll be in a tight fix if the *Tahmasib* doesn't arrive."

He was carrying his electric saw on his shoulder—like a rifle.

"But she will," Galya said with conviction. She jumped down from the platform and Stetsenko hastened to catch her. "Thanks, Kostya. She certainly will, boys."

"Still I think we should suggest to the chief he cut the rations again," said Kozlov. "At least for the men."

"What nonsense," said Zoya. "I've read women endure hunger much better than men."

They walked behind the slowly moving platform.

"Women do," said Potapov. "But not kids."

"Isn't he witty," said Zoya.

"No, really, boys, I mean it," said Kozlov. "If Bykov isn't here tomorrow we ought to drum up everybody and suggest cutting the rations."

"Well," said Stetsenko. "I don't think anyone's going to object."

"I won't," declared Gregor.

"That's good," said Potapov. "I was just thinking what was to be done if you did."

"Greetings to the water-carriers," Astrophysicist Nikolsky said, passing by.

Galya said angrily:

"Shame on you, Kozlov, and on all of you. I don't understand how you can worry about your bellies so blatantly—as if the *Tahmasib* were a robot with not a man on board."

Even Potapov flushed and was stumped for a reply. The rest of their way to the galley they covered in silence. Uncle Hoak was sitting gloomily at the huge ion exchanger they used to purify the water. The platform stopped at the entrance.

"Unload it," Uncle Hoak said, looking at the floor. It was unusually quiet, and cool, and odourless in the galley, which was more than Uncle Hoak could bear.

In silence the blocks of ice were unloaded and thrust into the jaws of the water-purifier.

"Thanks," Uncle Hoak said, still not looking up.

"You're welcome, Uncle Hoak," said Kozlov. "Come on, boys."

In silence they headed for the store and in silence they went back to the rest-room. Galya picked up a book and settled down into her chair in front of the magnetovideophone. Stetsenko hovered irresolutely near by, glanced at Kozlov and Zoya who sat at their table again (Zoya was studying by correspondence at a power institute and Kozlov was helping her), then heaved a sigh and shuffled away to his room. Potapov said to Gregor:

"Come on now—it's your move."

CHAPTER TWO

MEN ABOVE THE ABYSS

1. The captain breaks bad news while the engineer is being brave.

Apparently a large meteorite had hit the reflector, at once breaking the symmetry of thrust distribution on the surface of the paraboloid and sending the *Tahmasib* into a frenzied spin. In the control room Captain Bykov alone did not lose consciousness. To be sure he had knocked his head hard against something, then his side, and been completely winded for a while, but he had managed to retain his hold on the chair against which the first shock had hurled him and he had been clutching, crawling, reaching out until at last he reached the control panel. All was revolving round him at an incredible speed. Zhilin dropped from somewhere up above and flew past him, his arms and legs thrust out, with not a bone whole, it seemed to Bykov. Then he bent his head over the panel and, taking a careful aim, jabbed his finger at the key he wanted.

The cyber-navigator fired the emergency hydrogen engines and Bykov felt another jerk as if he were in a train stopped at full speed—only much more violent. He'd been bracing against the impact for all he was worth and so he was not pitched out of his seat. But for a moment all went dark in front of his eyes, and his mouth was full of chipped-off tooth enamel. The *Tahmasib* righted herself out. Then he steered her straight through the cloud of rock and iron gravel. Blue flashes churned on the screen of the forward scanner. There were many of them, far, far too many, but the ship no longer yawed: the meteorite device was switched off and the cyber held a true course. Above the noise in his ears Bykov heard hissing sounds several times and was enveloped by icy vapours, but he only drew in his head and bent lower over the control panel. Once something burst behind him, scattering fragments. Presently there were fewer flashes on the screen, then none. The meteoric attack was over.

Bykov glanced at the course plotter. The *Tahmasib* was falling. She was falling through Jupiter's exosphere in a narrowing spiral at a speed which was much slower than the orbital. She'd lost speed during the meteoric attack. A ship always loses her speed in such cases through changing her course. This is what happens during the routine Jupiter-Mars and Jupiter-

Earth flights which take ships through the asteroid belt. But there it's not dangerous. Here, over Jupe, loss of speed spells certain destruction. The ship will be burnt up in the denser layers of the monster planet's atmosphere. That's what happened to Paul Danget ten years before. And if she doesn't burn up she will fall into the hydrogen abyss from which there is no return. That's what probably happened to Sergei Petrushevsky early this year.

Only a photon engine could effect a pull-away. Quite mechanically Bykov pressed the ribbed key of the starter. But not a single lamp flashed on the control panel. The reflector was damaged and the auto-emergency device had blocked an unreasonable order. This is the end, thought Bykov. He turned the ship in a tidy manoeuvre and switched the emergency engines to full blast. A load of 5 G's pressed him into the chair. That was the only thing he could do in the circumstances: reduce the speed of fall to a minimum to prevent her from burning up. For thirty seconds he sat immobile, staring at his hands, which appeared increasingly dropsical with overload. Then he cut the fuel and the overload was gone. The emergency engines would go on braking—as long as there was fuel. But there wasn't much. There had never been a case of emergency engines saving anyone over Jupiter. Over Mars, Mercury or Earth, possibly. But never over that monster.

Bykov heaved himself up and looked beyond the panel. On the floor among plastic fragments lay the navigator, stomach up, looking like a man drowned.

"Misha," Bykov called in a whisper. "You all right, Misha?"

There was a scraping sound and Zhilin crawled on all fours from under the reactor casing. He, too, seemed to be in a bad way. He stared dazedly at the captain, the navigator and the ceiling, then sat up and crossed his legs.

Bykov clambered out of his seat and sank on his haunches beside the navigator, bending his knees with an effort. He touched the man's shoulder and called again:

"You all right, Misha?"

The navigator winced and, without opening his eyes, licked his lips.

"Alexei, old chap," he said in a weak voice.

"Any pain?" Bykov asked and started feeling all over the navigator.

"Ugh!" the navigator said and opened his eyes wide.

"And here?"

"U-ugh!" the navigator said in a painful voice.

"And here?"

"Oh, stop it," the navigator said and sat up, propping himself with his hands. His head lolled to his shoulder. "Where's Ivan?" he asked.

Bykov looked round but couldn't see Zhilin.

"Ivan," Bykov called softly.

"I'm here," Zhilin responded from behind the casing. They heard him drop something and swear under his breath.

"Ivan's all right," Bykov told the navigator.

"That's good," Mikhail Antonovich said and, clutching the captain's shoulder, got up.

"How do you feel, Misha?" asked Bykov. "In condition?"

"In condition," the navigator said uncertainly, Still clutching him. "Looks like I am."

He looked at Bykov with an air of surprise and said:

"What a cat of nine lives man is, eh? Still alive. ..."

"Hm," Bykov said vaguely. "Still alive. Look, Mikhail..." he said and paused. "Things're bad with us. We're falling, old man. If you are in condition, sit down to it and do a little computing— see how things stand. The computer seems intact," he threw a glance at the machine. "But you'd better see for yourself."

Mikhail Antonovich's eyes became round.

"Falling?" he said. "Are we? Falling. On Jupiter?"

Bykov nodded.

"Well, well, well," said Mikhail Antonovich. "Just imagine that! O.K. Just a second. I'll be at it in a second."

He stood for a while, wincing and jerking his head, then let go of the captain and, clutching at the edge of the control panel, hobbled to his place.

"I'll do the computing," he mumbled. "Right away."

Bykov watched him sink into his chair, his hand pressed to his side, then settle more comfortably, grunting and sighing. The chair was bent and sagged to one side. When quite comfortable, Mikhail Antonovich shot his eyes at Bykov and said in alarm:

"But you've braked, old chap, haven't you?"

Bykov nodded and went to Zhilin over the scattered debris crunching underfoot. On the ceiling he noticed a black spot and another one right where a wall joined it. They were meteoric holes filled in with synthetic resin. Large drops of condensed water trembled round the spots.

Zhilin was sitting cross-legged in front of the reflector control combine. Its casing was split in two, its innards looking anything but encouraging.

"How're things?" Bykov asked, though he could see for himself.

Zhilin raised a swollen face.

"Don't know all the details yet," he said. "But it's smashed all right."

Bykov squatted by his side.

"One meteoric hit," said Zhilin. "And twice I barged into this," with his finger he pointed but it was obvious where he meant anyway. "Feet first at the very beginning and head first at the very end."

"I see," said Bykov. "No apparatus could have stood that, of course. Rig up the spare. And another thing—we're falling."

"I heard you first time, Alexei Petrovich," said Zhilin.

"Come to that," Bykov said musingly, "what's the use of a control combine if the reflector's smashed."

"But what if it isn't?" said Zhilin.

Bykov smiled at him wryly.

"That merry-go-round," he said, "can have either of two explanations. Either for some reason the plasma burning point jumped out of focus or a large piece of the reflector broke off. I think it's the reflector because nobody could have shifted the burning point. But you go on all the same— rig up the spare set."

He rose and threw back his head to examine the ceiling.

"Must patch up the holes better," he said. "Pressure's high down there—might force the resin out. Well, I'll see to it."

He turned to go but halted and said:

"Not afraid, are you, youngster?"

"No," said Zhilin.

"Good. Carry on," said Bykov. "I'll make a round of her and then there're passengers to be hauled out of the acceleration absorbers."

Zhilin didn't say anything. He watched the captain's broad stooped back out of sight and then suddenly at arm's length saw Varya. She stood upright, her prominent eyes winking slowly. She was white-specked blue all over and the bosses on her muzzle stuck out in a terrifying manner. That meant she was very much annoyed and feeling unwell. Zhilin had once seen her in that state before. That had been a month ago on the Mirza-Charle spacedrome when Yurkovsky harangued them on the amazing adaptability of Martian lizards and to prove it dipped Varya into a tank of boiling water.

Varya opened her huge grey Jaws in a spasm and then snapped them shut.

"Well, how about you?" Zhilin said softly. A heavy drop tore off the ceiling and smack! hit the burst combine casing. Zhilin looked up. High pressure down there. Yes, he thought, tens and hundreds of thousands of atmospheres. The resin stoppers would certainly get forced out.

Varya stirred and opened her jaws again. Zhilin rummaged in his pocket, found a biscuit and tossed it into the yawning mouth. Varya swallowed slowly and stared away glassily. Zhilin sighed.

"You poor beast," he said softly.

2. The planetologists keep guilty silence while the radio astronomer sings a song about swallows

As soon as the *Tahmasib* stopped somersaulting Dauge disengaged himself from the breech and pulled the unconscious Yurkovsky from under bits of smashed equipment. He hadn't stopped to see what was smashed and what wasn't, but noticed that plenty was, that the bomb-rack was all bent and the control panel of the radiotelescope buried under bomb-cases.

It was hot in the bay and there was a pungent smell of something burnt.

He had got off fairly lightly. The moment the ship was hit he clutched bulldog-like at the breech until blood seeped under his nails and was worse off only by a splitting headache now. Yurkovsky's face was ashen and his lids lilac. Dauge blew into his face, shook him by the shoulders, slapped his cheeks. Yurkovsky's head was lolling and he showed no signs of coming to. Then Dauge dragged him to the sick bay. In the gangway it was terribly cold, with hoarfrost sparkling on the walls. Dauge put Yurkovsky's head in his lap, scraped a little hoarfrost off a wall and pressed it to his temples. That was where the step-up in acceleration found him. Dauge lay flat, but felt so bad that he turned on his stomach and rubbed his face against the hoarfrosted floor. After the acceleration was off Dauge lay a little longer, then struggled up and, seizing Yurkovsky under the arm-pits, dragged him, backing, farther. But he soon realised he wouldn't make it to the sick bay, so he dragged Yurkovsky into the mess room and on to a sofa, and plopped down at his side, grunting and catching breath. Yurkovsky was wheezing horribly.

Having recovered a little, Dauge got up and went to the sideboard. He took a jug of water and drank from it. Water trickled down his chin and throat and he found it most pleasant. Then he went back to Yurkovsky and sprinkled his face. He put the jug down on the floor and unbuttoned Yurkovsky's jacket. There was a strange pattern of winding lines running across /his chest from shoulder to shoulder. The pattern looked like a bunch of seaweeds—purplish against the sun-tanned skin. For some time Dauge stared, understanding nothing, then all of a sudden it struck him that it was the mark of a violent electric shock. Apparently Yurkovsky had fallen on some bare contacts under high voltage. Dauge ran to the sick bay.

He had made four injections altogether before Yurkovsky at last opened his eyes. They were dull and glassy but Dauge was overjoyed.

"You gave me quite a turn, Vladimir," he said with relief. "I thought things were really bad. Well, can you get up now?"

Yurkovsky moved his lips, opened his mouth and wheezed again. His eyes assumed meaning, his brows pressed together.

"There, there, don't move," said Dauge. "You'd better stay on your back for a while."

He turned and saw Charles Mollard in the doorway. He was swaying, steadying himself against the jamb. His face was red and swollen, and he was dripping wet and festooned all over with something white and worm-like. Dauge even fancied that he was steaming. For a few minutes Mollard did not say a word, shifting his sad eyes from Dauge to Yurkovsky and back, while the planetologists stared in confusion at him. Yurkovsky even stopped wheezing. Presently Mollard swayed forward, stepped over the coaming and went straight to the nearest chair. He looked wet and miserable and when he sat down a tasty smell of boiled meat filled the room. Dauge sniffed.

"Soup?" he enquired.

"Oui, monsieur," Mollard confirmed sadly. "Vermicelli soup."

"And how's the soup? Good?" asked Dauge.

"Good," said Mollard and started picking vermicelli off himself.

"I like soup very much," Dauge explained. "And I always ask how it is."

Mollard sighed and smiled.

"No more soup," he said. "It was very hot soup. But the water was no longer boiling."

"Good God," said Dauge, who couldn't help bursting into laughter. Mollard laughed with him.

"Yes," he shouted. "It was very funny but not comfortable and the soup is all gone."

Yurkovsky wheezed. His face contorted and flushed purple. Dauge looked at him with alarm.

"Voldemar knocked badly?" asked Mollard.

Craning his neck he glanced at Yurkovsky with mixed fear and curiosity.

"Voldemar had an electric shock," said Dauge. He was no longer grinning.

"But what happened?" said Mollard. "It was so uncomfortable...."

Yurkovsky stopped wheezing, sat up and, baring his teeth horribly, began searching in his breast pocket.

"What's up, Vladimir?" Dauge asked, at a loss.

"Voldemar can't speak," Mollard said softly.

Yurkovsky nodded rapidly, got his fountain-pen and pad out and began writing, his head jerking.

"Don't upset yourself so, Vladimir," Dauge mumbled. "It'll be all right in no time."

"Yes," Mollard confirmed. "I had the same experience. It was high voltage and I was all right very soon."

Yurkovsky gave the pad to Dauge, lay back and shut his eyes.

" 'Can't speak'," Dauge made out with difficulty. "Don't worry, Vladimir, it'll pass." Yurkovsky jerked impatiently. "Well, just a moment. 'What about Alexei and the pilots? And the ship?' "

"I don't know," Dauge said in confusion and glanced towards the control room. "Hell, I forgot everything."

Yurkovsky jerked his head and also looked at the door.

"I'll find out," said Mollard. "I'll find out everything."

He rose from his chair, but at that moment the manhole to the control room was opened and in strode Captain Bykov, huge, dishevelled, with a violently purple nose and a black right eye. He measured them all with his small, irate eyes, went up to the table, put his fists on it and asked:

"Why are the passengers not in their acceleration absorbers?"

It was said very quietly, but in a tone that instantly wiped off Mollard's happy smile. A tense silence descended. Dauge smiled a small awkward smile and looked aside, and Yurkovsky again shut his eyes. Things look bad, thought Yurkovsky. He knew his Bykov.

"When are we going to have discipline on board this ship?" Bykov said.

The passengers were silent.

"You kids," Bykov said in disgust and sat down. "It's a madhouse. What's happened to you, Monsieur Mollard?" he asked in a tired voice.

"It's the soup," Mollard said readily. "I'll go and clean myself at once."

"Wait a minute, Monsieur Mollard," said Bykov.

"Where ... where are we?" Yurkovsky wheezed out.

"We're falling," Bykov said briefly.

Yurkovsky started and sat up.

"Where ... where to?" he asked.

"Into Jupiter," said Bykov. He was not looking at the planetologists. He was looking at Mollard. He felt sorry for him. It was his first real space flight and he was eagerly expected at Amaltheia as a first-class radio astronomer.

"Oh." said Mollard. "Into Jupiter?"

"That's right," Bykov said and paused, feeling the bump on his forehead. "The reflector's smashed. Its control is smashed too. There are eighteen holes in the ship."

"Are we going to burn up?" Dauge asked quickly.

"Don't know—Mikhail's figuring it out. It's possible we aren't."

He fell silent. Mollard said:

"I'll go and clean myself."

"Wait a minute, Charles," said Bykov. "I wonder whether I made myself sufficiently clear, Comrades? We are falling into Jupiter."

"We understand," said Dauge.

"We'll be falling into Jupiter all our lives," said Mollard. Bykov glanced at him sharply sideways.

"Well said," said Yurkovsky.

"C'est un mot," said Mollard. He was smiling happily. "May I ... may I go and clean myself nevertheless?"

"Yes, go," Bykov said slowly.

Mollard went out. They all watched him go. Then they heard him start up a song in the gangway, in a weak but pleasant voice.

"What is he singing?" asked Bykov. Mollard had never sung before.

Dauge listened and then translated:

" 'Two swallows kiss each other outside the window of my spaceship. In the void. How did they get there? They love each other dearly and they ripped it there to admire the stars. Tra-la-la. But what do you care?' Or something like that."

"Tra-la-la," Bykov said musingly. "Damn good!"

"You tr-tr-translate m-m-masterfully," said Yurkovsky. "Ripped it there. P-p-piece of art."

Bykov threw an astonished glance at him.

"What's that, Vladimir?" he asked. "What's happened to you?"

"St-st-stutterer for the r-r-rest of my life," Yurkovsky replied with a crooked smile.

"He's had an electric shock," Dauge said quietly.

Bykov pursed his lips.

"Well, cheer up," he said. "We've been through worse scrapes."

But he knew they'd never had it so bad before — neither he nor the planetologists. Through the half-open manhole came Mikhail Antonovich's voice:

"I'm ready, Alexei."

"Come in here," said Bykov.

Mikhail Antonovich, fat and scratched, rolled into the mess room. The upper portion of his body was stripped bare and glistening with sweat.

"Br, isn't it cold?" he said, clasping his fat chest with his pudgy hands. "But it's terribly hot in there."

"Fire away, Mikhail," Bykov said impatiently.

"But what's happened to Vladimir?" the navigator asked in a frightened voice.

"Come on," said Bykov. "He's had an electric shock."

"And where's Charles," the navigator asked, sitting down.

"Charles is alive and kicking," Bykov said, hardly able to control himself. "So's everybody. Come on, out with it."

"Thank God," said the navigator. "Well, boys. I've done a little computing and here's what it adds up to. The *Tahmasib* is falling and we haven't enough fuel to pull her out."

"Clear as noonday," Yurkovsky said almost without stuttering.

"Not enough fuel. The photon reactor could do that but it seems the reflector is smashed. But we have enough fuel for braking. So I've drawn up a programme. We're not going to burn up provided the generally-recognised theory of Jupiter's structure is correct."

Dauge wanted to say there was no generally-recognised theory of Jupiter's structure and never had been, but desisted.

"We're already braking quite well," went on Mikhail Antonovich. "So I believe we'll have a safe fall. Beyond that nothing can be done, boys." Mikhail Antonovich smiled guiltily. "Unless, of course, we repair the reflector."

"There are no repair stations on Jupiter," Bykov said in a croaking voice. "Any theory on Jupiter will tell you that." He wanted them to understand. To understand right and thoroughly. It still seemed to him they didn't.

"Which theory do you take as generally recognised?" asked Dauge.

Mikhail Antonovich shrugged a plump shoulder.

"Kangren's theory," he said.

Bykov looked at the planetologists in expectation.

"Well," said Dauge. "Might as well take Kangren's."

Yurkovsky was staring at the ceiling.

"Look here, planetologists," Bykov tackled them. "What's waiting for us down there? Can you tell us that, experts?"

"Why, of course," said Dauge. "We'll tell you that pretty soon."

"When?" Bykov said, brightening.

"When we are down there," Dauge said and grinned.

"Planetologists!" said Bykov. "Some experts!"

"It could be calculated," Yurkovsky said, still staring at the ceiling. He spoke slowly, almost without a stutter. "Let Mikhail calculate at what depth the ship will stop falling and hang in balance."

"That's interesting," said Mikhail Antonovich.

"According to Kangren, pressure inside Jupiter is increasing fast. What you should calculate, Mikhail, is the eventual depth of immersion, pressure, pull of gravity."

"Yes," said Dauge. "What will the pressure be? Perhaps we'll just be flattened."

"Hardly," Bykov growled. "We can bear two hundred thousand atmospheres. And the photon reactor and the hydrogen engines even more."

Yurkovsky sat up, crossing his legs.

"Kangren's theory is as good as any," he said. "It will give you the order of magnitude." He looked at the navigator. "We could do it ourselves but you've got the computer."

"Of course," said Mikhail Antonovich. "What's there to discuss? Of course I'll do it, boys."

Bykov said:

"Mikhail, get the programme for me, will you, and then feed it into the cyber."

"I've fed it in, Alexei old chap," the navigator said guiltily.

"Aha," said Bykov. "Well, all right." He rose. "There you are. It's all clear now. We won't be crushed, of course, but neither will we ever come back. Let's face it. Well, we're not the first. An honest end to an honest life. Zhilin and I are going to tinker a little with the reflector, but it's so—" he made a wry face and twitched his swollen nose. "What will you be doing?"

"Observing," Yurkovsky said harshly. Dauge nodded.

"Very good." Bykov threw a searching glance at them. "I want to ask you something. Look after Mollard."

"Yes, of course," said Mikhail Antonovich. "He's new to it and ... well, all sorts of things happen . .. you know."

"All right, Alexei," Dauge said, smiling cheerfully. "Don't worry. We'll look after him."

"So that's that," said Bykov. "You, Misha, go to the control room and do all the calculations that are needed, while I hop over to the sick bay for a massage. I've had my side knocked about rather badly." Leaving, he heard Dauge say to Yurkovsky:

"In a certain sense we've been lucky, Vladimir, we'll see something nobody's seen before. Let's go and do the repairs."

"Y-yes, c-come on," said Yurkovsky. Well, you won't fool me, thought Bykov. You still don't understand. You still have hope. You think Alexei will pull you out of this hydrogen tomb just as he pulled you out of Golconda's black sands and rotten swamps. That's what Dauge thinks anyhow. But Alexei won't. Or will he?

In the sick bay, breathing through nostrils extended with pain, Mollard was smearing himself with thick tannic ointment. His face and arms were lobster-red and shiny. Catching sight of Bykov he smiled amiably and struck up his song about the swallows. He was almost calm now. Had he not started his song Bykov would have been sure he was really calm. But Mollard was singing in a voice that was over-loud and deliberate, hissing with pain every now and then.

3. The engineer reminisces while the navigator advises shutting off memory.

Zhilin was repairing the reflector control combine. It was hot and stuffy and he thought the ship's air conditioners must have broken down but he had no time or wish to see to them. At first he threw off his jacket, then his overalls, and remained in shorts and shirt. Varya settled promptly on the discarded overalls and soon was invisible, save for her shadow and her prominent eyes, which flashed into presence sometimes.

Zhilin was getting out of the torn casing plastic-metal printed circuits, sounding the good ones, putting aside those that were cracked and replacing them by spares. He worked steadily and unhurriedly as during a repairs test, because he had all the time he needed and because anyway it would probably be to no purpose. He tried not to think of anything and was happy he remembered the general scheme quite well, enough to avoid consulting the servicing volume more than a couple of times, and that he'd been knocked about not so badly after all and there were only scratches on his head. Behind the photon reactor casing the computer buzzed, Mikhail Antonovich rustled paper and hummed to himself something unmelodious. He always hummed something to himself when working.

I wonder what's he doing now, thought Zhilin. Or perhaps he's just trying to keep his mind busy. It's great to be able to pick up work at a time like this. The planetologists are also working now most likely, dropping bomb-probes. So I haven't seen a stick of probes go off after all. Or a lot of other things either, for that matter. They say, for instance, Jupe's a smashing sight from Amaltheia. And I always wanted to go on an astral trip or a pathfinder expedition to another planet to search for signs of beings from outer worlds. And then they said there were some nice girls on the J-stations and I wanted to meet them to have something to brag about to Perez Junto—he's been assigned to lunar routes and is happy about it too, rum sort as he is. Funny the way Mikhail Antonovich is singing out of tune—as if on purpose. He's married and has two children, no, three, and the eldest, a girl, is sixteen; he's been promising to introduce me and winking raffishly every time, but that is not to happen. Nor a lot of other things.

Father will be terribly upset—that's bad. Just my rotten luck that it should have happened on my first independent trip. It's a good thing she and I have drifted apart, it suddenly occurred to him. Altogether easier. It's much harder, say, for Mikhail Antonovich. Or for the captain. The captain's wife's beautiful and clever, likes a laugh, too. When she was seeing him off she didn't seem worried at all, or perhaps she was, but didn't show it, though I rather thought she wasn't, being used to it. You get used to anything. I for one got used to acceleration, though at first felt suicidal and even expected they'd transfer me to the Ground Control Department. It was called "joining the girls", the Department being mostly female, and considered a disgrace. Nobody was quite sure why though, for the girls were good company and later worked at the various Spu's and stations and bases on other planets, giving a very good account of themselves. Better than boys sometimes. Anyway, thought Zhilin, it's a good thing we've drifted apart. Just imagine what she'd be thinking now. And he stared meaninglessly at the cracked circuit he was holding in his hand.

We kissed in the Bolshoi Park and then on the embankment under some white statues, and then I saw her home and we kissed more in the entrance hall of her block of flats and people kept going up and down all the time despite the late hour. She was afraid her mother might appear any moment and ask her what she thought she was doing there and who that young man was. That was in summer, during the white nights. Then I came for my winter vacation and we met again, and it was like that first time, only there was snow in the park and bare branches stirred in the grey low sky. Her lips were soft and warm and I remember I told her I found kissing more of a winter occupation. Gusts of wind showered snow on us until we felt quite frozen and ran for warmth and shelter to a cafe in the Street of Spacemen. I remember how happy we were to find it empty. We settled at a window and watched the cars sweep by outside. I betted her I knew all the car makes and lost: a flash low-seated job pulled up at the kerb which I couldn't name. I went outside to enquire and was told it was a Golden Dragon, the new Chinese atom-powered car. The stake was three wishes for the winner. It seemed then that it would be like this always, in winter and in summer, on the embankment under the white statues and in the Bolshoi Park, and in the theatre where she looked breathtakingly beautiful in her black dress with a white collar and was nudging me all the time so I wouldn't laugh so loud. But one day she didn't turn up and I made another date by videophone. And she didn't come again, and she didn't answer my letters when I went back to the School. I still wouldn't take it. I kept sending her long and foolish letters, though I didn't know at the time they were foolish. A year later I saw her in our club. She was with another girl and didn't recognise me. I felt then life was over for me, but it wore off by the end of my fifth year and I can't even understand why I should be remembering all this now. Probably because it doesn't matter any longer. Yes, I think I wouldn't want to be reminiscing otherwise. ...

The hatch clanged. Bykov's voice said:

"How're things, Mikhail?"

"Finishing the first spiral, Alexei. Dropped three hundred miles."

"Well..." Zhilin heard somebody kick plastic fragments along the floor. "And of course no communication with Amaltheia?"

"The receiver's dead," said Mikhail Antonovich and sighed. "The transmitter's working but there are such radio storms here...."

"What about your calculations?"

"Almost finished. We'll drop something in the order of four thousand miles and then hang, it appears. Floating, as Vladimir says. The pressure'll be terrific but not big enough to crush us—that's clear. It will be big enough, however, to make it hard for us, with a load of anything up to 2.5 G's."

"Hm," said Bykov. For a while he was silent, then said, "Have you got any idea?"

"Pardon?"

"I say, have you got any idea—how to get out of it?"

"Why, no, old chap," the navigator said gently, almost ingratiatingly. "How could I. It's Jupiter. Why, I have never even heard about anybody ever ... getting out of here."

A long silence descended. Zhilin began working again, quickly and noiselessly. Then Mikhail Antonovich said in a rush:

"You stop thinking about her, old chap. Much better not to, or you start feeling so rotten, really...."

"But I'm not," Bykov said in a grating voice. "And you'd be well advised not to. Ivan!" he yelled.

"Here," Zhilin called back and started working urgently. "Still at it?" "Finishing soon," he said.

He heard the captain coming across to him, kicking plastic fragments out of his path.

"Litter everywhere," Bykov was muttering. "A real pigsty." -He emerged from behind the casing and squatted beside Zhilin.

"I'm finishing," Zhilin repeated. "Taking your time about it, aren't you," Bykov growled.

He grunted and started emptying the spare blocks out of the kit on to the floor. Zhilin shifted a little to make more room for him. They were both big and broad, and there was really not quite enough elbow-room for both of them in the space in front of the combine. They worked silently and rapidly, and soon heard Mikhail Antonovich start his computer again and then begin humming to himself.

When they were through Bykov called out:

"Mikhail, come here, will you."

" He straightened up and wiped sweat off his forehead. Then he kicked aside the heap of Cracked circuits and switched on the general control. The 3D reflector scheme appeared on the screen. It was revolving slowly. "Well, well, well," said Mikhail Antonovich.

A blue graph started tick-tick-tick, unreeling slowly.

"Not too many microholes," Zhilin said quietly. "Microholes be hanged," Bykov said, made an ugly face and bent close to the screen. "Look at this bastard."

The reflector scheme was tinted blue. Now this blue was showing ragged patches of white. Those were the spots where either the mesosubstance layers were pierced or control cells smashed. There were plenty of white spots, and to one side of the reflector they ran into a big blotch of white taking up at least one-eighth of the paraboloid's surface.

"Just look at this bastard," Bykov repeated and thrust his thumb between his teeth. He was thinking.

Mikhail Antonovich shook his head and went back to his computer.

"The thing's only good for fireworks now," Zhilin muttered. He reached for his overalls, shook Varya out and pulled them on: it had got cold again. Bykov was still standing looking at the screen and biting at a nail. Presently he picked up the blue graph and ran a cursory eye over it.

"Zhilin," he suddenly said in a tense voice. "Get a couple of sigma-testers, check them and go to the air-lock. I'll be waiting for you there.

Mikhail, drop everything and start reinforcing the holes. I said drop everything." "Where're you going, old chap?" Mikhail Antonovich asked in surprise.

"Outside," Bykov said and went out. "But what for?" Mikhail Antonovich asked, turning to Zhilin.

Zhilin shrugged. He didn't know what for. Repairing a mirror in space and in flight, without mesochemists, without huge crystallisers, without reactor furnaces, was absolutely impossible. As absolutely impossible as, say, pulling the Moon to the Earth with your bare hands. And as it was, with a corner smashed, the reflector could only impart a spinning movement to the ship. Just what it did when the thing had happened.

"Makes no sense," Zhilin said uncertainly.

He looked at Mikhail Antonovich and Mikhail Antonovich looked at him. They never said a word but all of a sudden were both in a terrible hurry. Fussily Mikhail Antonovich gathered up his sheets, saying urgently:

"You go, Vanya. You go quickly."

In the air-lock Bykov and Zhilin got into space suits and then squeezed themselves into the lift. The cab raced along the gigantic tube of the photon reactor which stringed all the ship's compartments—from the living quarters down to the parabolic reflector.

"Good," said Bykov.

"What's good?" asked Zhilin.

The lift stopped.

"It's good the lift's in order," said Bykov.

"Ah." Zhilin was disappointed.

"It might have been out of order," Bykov said sternly. "You'd have to crawl all of seven hundred feet there and then back."

They stepped out on to the upper platform of the paraboloid. The black ribbed dome of the reflector sloped in a curve from under their feet. It was enormous: 700 yards in length and 500 yards in diameter. From where they stood they could not see its edges. Poised over their heads was the huge silver disc of the cargo bay. On its sides, slung far out on brackets the hydrogen engines shot out silent furious blue flames. An awesome world gleamed eerily round them.

A bank of carroty fog stretched on their left. Far down, incredibly deep underfoot, the fog lay-in fat layers of cloud with darker gaps in between. Still farther and deeper, the clouds ran together into a dense brown expanse. On their right all was enveloped in an even pink haze in which Zhilin saw suddenly the Sun—a small bright pink disc.

"Take this," said Bykov. He thrust a coil of thin cable into Zhilin's hands. "Make it fast in the lift shaft, will you," he said.

He made a noose with the other end of the cable and fastened it round his waist. Then he slung both testers round his neck and swung his legs over the railing.

"You pay it out," he said. "Here goes."

Zhilin stood against the railing, gripping the cable with both hands and watching the thick awkward figure in a bright space suit slowly disappear beyond the curvature of the dome. The suit gleamed pinkish and the ribbed dome sent off pinkish reflections too.

"Pay it out livelier," Bykov's angry voice boomed inside Zhilin's helmet.

The space-suited figure crawled out of sight and there was only the bright taut line of the cable on the ribbed surface now. Zhilin glanced at the Sun. It was veiled by haze now, sharply outlined and almost red.

Zhilin looked down at his feet and saw his own blurred pinkish shadow.

"Look, Ivan," Bykov's voice said. "Look down!"

Zhilin looked. Deep down, bulging out of the brown expanse, was a colossal whitish mass looking like a monstrous toadstool. It was swelling out slowly and a pattern like a bunch of writhing snakes could be seen quivering on its surface.

"An exospheric protuberance," said Bykov. "A rare thing—as far as I know. A pity the boys aren't here to see it."

He meant the planetologists. The mass was suddenly lighted from within with trembling lilac luminescence.

"Whew, what a sight," Zhilin said involuntarily.

"Pay it out," said Bykov.

Zhilin payed out more cable without taking his eyes off the protuberance. At first it seemed to him as though the ship was going to pass through it, then he realised it would be far on the starboard. The protuberance tore off the brown mass and sailed towards the pink haze, trailing behind it a tail of yellow transparent filaments. Again a lilac glow flickered on in them and died out. Presently the protuberance was lost in the pink haze.

Bykov worked for a long time. He would return to the platform for a short rest and then crawl in a new direction. When he climbed back for the third time he had only one tester. "Dropped it," he said laconically. Zhilin payed out the cable patiently, bracing his foot against the railing. He felt quite secure in this position and could watch for sights. But nothing happened. Only when the captain climbed up for the sixth time and muttered, "That'll do," did he realise that the carroty wall on the left—Jupiter's cloudy surface — was visibly nearer.

It was clean and tidy in the control room. Mikhail Antonovich had swept it out and was sitting in his usual place, huddled in a fur jacket over his overalls. It was so cold in the room that one could see his breath. Bykov sat down in his chair, 'leaned forward, propping himself against his knees, and looked closely first at the navigator, then at the engineer.

"Have you plugged the holes tighter?" he asked the navigator.

Mikhail Antonovich nodded several times. "We've got a chance," said Bykov. Mikhail Antonovich sat up and took in a noisy breath. Zhilin swallowed. "We've got a chance," Bykov repeated. "A tiny chance. A fantastic chance." "Go on, Alexei," the navigator begged. "It's like this," Bykov said and cleared his throat. "Sixteen per cent of the reflector surface is gone. The question is: can we make the other eighty-four per cent work? Less than that in fact, because another ten percent or so is-uncontrollable, the control cells being smashed."

The navigator and engineer listened intently, craning their necks.

"The answer is we can," said Bykov. "We can try anyway. We must shift the plasma burning point so as to compensate asymmetry in the damaged reflector."

"I see," Zhilin said in a trembling voice.

Bykov threw him a glance.

"That is our only chance. Ivan and I are going to reorientate the magnetic traps. I've seen Ivan in action. You, Misha, will calculate a new position for the burning point in accordance with the pattern of the damage. You'll have that pattern straight away. It's a hell of a lot of work, but it's the only chance we've got."

His eyes were full on the navigator. Mikhail Antonovich looked up and their glances met. They understood each other immediately and completely. They understood it might be too late. That down there, where pressure was terrific, corrosion would eat into the ship's hull so that she might dissolve like a lump of sugar in boiling water before they finished. That they couldn't even hope to achieve complete compensation. That nobody had ever attempted before to steer ships with such a compensation, the engines at least one-third below rated power.... .

"It's the only chance we've got," Bykov said loudly.

"I'll do it, old chap," said Mikhail Antonovich. "It's not difficult to calculate a new point. I'll do it."

"I'll give you the pattern of the dead areas straight away," Bykov repeated. "And we must hurry all we can. Overgravity'1'1 soon be on us and make all work a hundredfold harder. And if we fell too deep the reactor'd be too risky to switch—might start off a chain reaction in the compressed hydrogen..." he paused and said, "make gas out of us."

"I see," said Zhilin. He felt a terrible urge to start that very minute, at once. He liked very much that tiny fantastic chance.

Mikhail Antonovich stretched out a stumpy hand and said in a thin voice:

"The pattern, give me the pattern, Alexei."

On the emergency panel three red lights flashed' on.

"There you are," said Mikhail Antonovich. "Fuel's running out in the emergency engines."

"Never mind," Bykov said and rose.

CHAPTER THREE

MEN IN THE ABYSS

1. The planetologists play while the navigator is caught smuggling.

"Load her," said Yurkovsky.

He was hanging at the periscope, his face thrust into the suede frame cover. He was hanging horizontally, stomach down, legs and elbows spread wide, with the thick log-book and fountain-pen floating within easy reach. Mollard slid the breech open smartly, pulled a case of bomb-probes out of the rack and, pushing it this way and that, forced it into the rectangular slit of the loading chamber. The case slid slowly and noiselessly into place. Mollard closed the breech, locked it and said:

"Ready, Voldemar."

Mollard was bearing weightlessness very well. Sometimes he made rash movements and hung at the ceiling so that he had to be pulled back, and sometimes he felt like being sick, but for a man experiencing weightlessness for the first time in his life his performance was very creditable.

"Ready," Dauge said at the exospheric spectregraph.

"Fire," ordered Yurkovsky.

Dauge pressed the trigger. They heard the deep doo-doo-doo of the breech, immediately followed by the tick-tick-tick of the spectrograph. In the periscope Yurkovsky saw white balls of fire flare up one after another and race upwards in the orange fog through which the *Tahmasib* was now falling. Twenty balls of fire for twenty bomb-probes, each carrying a meson emitter.

"Lovely," Yurkovsky said quietly. Pressure was increasing outside. The bomb-probes were exploding closer and closer because of the greater drag.

Dauge was speaking into the dictaphone, glancing at the reference device of the spectroanalyser.

"Molecular hydrogen—eighty-one point three five, helium—seven point one one, methane—four point one six, ammonia—one point zero one.... The unidentified line is increasing.... I told them we should have an automatic reader—it's so inconvenient...."

"We're falling," said Yurkovsky. "Just look how we're falling. Methane's down to four already...."

Dauge, turning adroitly, was keeping up with the readings on the other equipment.

"So far Kangren's right," he said. "There. The bathometer's dead—at three hundred atmospheres. No more pressure readings."

"Never mind," said Yurkovsky. "Load her."

"Is it worth it?" said Dauge. "Without the bathometer synchronisation will be faulty."

"Let's try," said Yurkovsky. "Load her."

He looked back at Mollard. He was swaying against the ceiling, smiling ruefully.

"Pull him down, Grigory," said Yurkovsky.

Dauge straightened up, caught Mollard by his foot and pulled him down. "Charles," he said patiently. "Try and avoid rash movements. Thrust your toes in here and hold fast."

Mollard heaved a sigh and slid the hatch open. The spent case floated out of the chamber, hit him in the chest and rebounded towards Yurkovsky, who dodged it.

"Oh, again," Mollard said guiltily. "I am terribly sorry, Voldemar. Oh, this weightlessness."

"Go on, load her," said Yurkovsky.

"The Sun," Dauge said suddenly.

Yurkovsky plunged his face in the periscope frame. For a fleeting moment he saw a reddish disc vague against the orange fog.

"It's the last we'll see of it," Dauge said and coughed.

"You have said that three times," Mollard said, closing the breech and bending down to make quite sure he'd done a good job of it. *"Adieu, le soldi,* as Captain Nemo used to say. But it turns out it was not the last time. I am ready, Voldemar."

"So am I," said Dauge. "But shouldn't we really call it a day?"

At that moment Bykov strode in to a loud clang of his magnetic boots.

"Knock off," he said morosely.

"But why?" Yurkovsky enquired, turning to him. .

"Big pressure outside. Another half-hour and your bombs'll be exploding in this bay."

"Fire," Yurkovsky said hastily. Dauge hesitated, then pulled the trigger. Bykov listened to the doo-doo-doo in the breech and said:

"Enough's enough. Batten all the instrument portholes. And spike this thing," he pointed at the bomb-release. "Spike it good and proper."

"Are periscopic observations still allowed?" asked Yurkovsky.

"Yes," said Bykov. "You may play a little more."

He turned and strode out.

"Just as I told you—not a damned thing," said Dauge. "Not with synchronisation gone."

He switched off his equipment and recovered the reel out of the dictaphone.

"Grigory," said Yurkovsky. "I have a shrewd suspicion Alexei's "up to something. What do you think?"

"I don't know," Dauge said and glanced at him. "What makes you think so?"

"Just something in his ugly mug," said Yurkovsky. "I know my man."

For a while everybody was silent, only Mollard, overcome by a feeling of nausea, heaved occasional sighs. Presently Dauge said:

"I'm famished. Where's our soup, Charles? You spilt our soup and we're hungry. Who's on duty today, Charles?"

"I am," said Charles. At the mention of food the nausea came over him again. But he said: "I shall go and make some more soup."

"The Sun." said Yurkovsky.

Dauge pressed his black eye to the viewer.

"You see," said Mollard. "The Sun again."

"But that isn't the Sun," said Dauge.

"No," said Yurkovsky. "It doesn't look like the Sun."

The distant luminescent mass in the light-brown haze paled, swelling and drifting apart in greying patches, and then disappeared. Yurkovsky watched, his teeth clamped together so hard that his temples ached. Farewell, Sun, he thought. Farewell, Sun.

"I'm hungry," Dauge said testily. "Let's go to the galley, Charles."

He pushed off the wall deftly, sailed towards the door and opened it. Mollard too pushed off and hit his head against the wall above the door. Dauge caught him by his spread-fingered hand and pulled him out into the gangway. Yurkovsky heard Grigory ask, "How's life—good?" and Mollard answer, "Good, but very inconvenient." "Never mind," Dauge said cheerily. "You'll get used to it soon."

Never mind, Yurkovsky thought, it'll be all over soon. He glanced into the periscope. He saw the brownish fog grow still denser overhead, while deep below in the incredible depths of the hydrogen abyss into which the ship was falling an eerie pinkish light beckoned to him. He shut his eyes. To live, he thought. To live long. To live eternally. He clutched at his hair. To live even if he were deaf, blind, paralysed.

Just to feel the sun and the wind on his skin and a friend by his side. And pain, impotence and pity. Just as now. He tore at his hair. Let it be just as now, but for ever. Suddenly he became aware he was breathing laboriously and came to himself. The feeling of unbearable, unreasoning terror was gone. This had happened to him before: on Mars twelve years before, in Golconda ten years before and again on Mars the year before last. A spasm of crazy desire just to live, a desire as obscure and primordial as protoplasm itself. It swooped on him like a black-out. But it always passed. It had to be endured like sharp pain. And he must start doing something. Alexei had ordered the instrument portholes to be battened. He took his hands from his face, opened his eyes and saw he was sitting on the floor. The ship's fall was being braked and things were acquiring weight.

Yurkovsky reached for a small panel and shut the instrument portholes, the orifices in the ship's hull through which the receptors of the instrumentation are thrust out. Then he carefully spiked the breech of the bomb-release, collected the scattered bomb-cases and stacked them neatly on the rack. Then he glanced through the periscope and it seemed to him that the darkness overhead had become denser and the glow underneath stronger. He thought that no one before had penetrated Jupiter to such a depth except Sergei Petrushevsky, may he rest in peace, and even he had probably been blown up earlier. His reflector was smashed too.

He went out into the gangway and headed for the mess room, glancing into all the cabins on his way. The *Tahmasib* was still falling, though more slowly every minute, and Yurkovsky walked on tiptoe as though under water, balancing with outspread arms and making involuntary little skips every now and then. In the quiet gangway Mollard's muffled call came to him like a war-cry: "How's life, Gregoire, good?" Apparently Dauge had managed 'to restore the Frenchman's high spirits. He could not catch Dauge's response. "Good," he muttered and even did not notice he was no longer stammering. Good—in spite of everything.

He glanced into Mikhail Antonovich's cabin. It was dark and there was an odd spicy smell. He went in and switched on the light. In the middle of the cabin lay a ripped suit case. Never before had he seen a suit case in such a state. It looked as though a bomb-probe had gone off inside it. The mat-finished ceiling and the walls were spattered with brown, slippery-looking blotches. These gave off a spicy aroma. Spiced mussels, he defined promptly. He was very fond of spiced mussels but they were unfortunately never part of space flyers' rations. He looked around and spotted a bright black patch—a meteoric hole '—just above the door. All sections of the living quarters were air-tight. When the hull was pierced by a meteorite, the air supply was automatically cut until the synthetic resin layer between the ship's sheetings had had time to seal the hole. It took a second, at the most two seconds, but pressure might drop quite substantially in that time. It was not dangerous for man but it would be fatal for contraband tinned food. Tins would just explode. Particularly when spiced. A plain case of smuggling, he thought. The old glutton. Well, you'll get it hot from the captain. Bykov's never stood for smuggling.

Yurkovsky gave the cabin a last glance and noticed that the black patch shone silver. Aha, he thought. Somebody must have been metallising the holes. Quite right too, for such a pressure would have just forced the resin stoppers out. He switched off the light and stepped back into the gangway. He felt dead tired and lead-heavy in his whole body. Oh, damn, I'm cracking up, he thought, and suddenly he realised that the tape on which his mike hung was cutting into his neck. Then he understood. The *Tahmasib* was arriving. Their flight was coming to an end. In a few minutes gravity would be doubled, overhead there would be six thousand miles of compressed hydrogen and under their feet forty thousand miles of supercompressed, liquid and solid hydrogen.

Every pound of their weight would increase to two or more. Poor Charles, he thought. Poor Misha.

"Voldemar," Mollard called from behind him. "Voldemar, help us carry the soup. It's a very heavy soup."

He looked back. Dauge and Mollard, both flushed and sweating, were pushing through the door of the galley a heavily-swaying trolley with three steaming pots on it. Yurkovsky made to meet them and only then fully realised how heavy he had become. Mollard uttered a vague sound and sank to the floor. The *Tahmasib* stopped. The ship, her crew, passengers and cargo had arrived at their last port of call.

2. The planetologists interrogate the navigator while the radio astronomer interrogates the planetologists.

"Who cooked this meal?" asked Bykov. He ran his eye round them and stared at the pots again. Mikhail

Antonovich was breathing in gasps, leaning heavily against the table top. His face was purplish and bloated. "I did," Mollard said timidly. "But what's wrong with it?" asked Dauge. They all spoke in hoarse voices, only able to wheeze out a few words at a time. Mollard smiled crookedly and lay back on the sofa. He felt quite bad. The *Tahmasib* had stopped and their weight was becoming unbearable. Bykov looked at Mollard.

"That meal will kill you," he said. "You'll eat and never get up again. It'll crush you, you understand?"

"Christ," Dauge said, annoyed. "I forgot all about gravity."

Mollard lay still, eyes closed, breathing heavily. His jaw was hanging open.

"We'll have the soup," said Bykov. "And nothing more. Not a bite." He glanced at Mikhail Antonovich and grinned mirthlessly. "Not a bite," he repeated.

Yurkovsky took the ladle and served the soup.

"A heavy meal," he said.

"Smells tasty," said Mikhail Antonovich. "Won't you give me a little more, Vladimir old man?"

"No more," Bykov said harshly. He was sipping his soup slowly, holding his spoon in a childish way in his fist, which was smeared with graphite lubricant.

They began eating in silence. Mollard made an attempt to get up and sank back again. "I can't," he said. "Excuse me, but I can't."

Bykov put down his spoon and rose.

"I recommend all passengers to get into their acceleration absorbers," he said. Dauge shook his head. "As you like," said Bykov. "But make sure Mollard gets into his."

"Right," said Yurkovsky.

Dauge took up Mollard's plate, sat down beside him and began spoon-feeding him expertly. His eyes closed, he was swallowing noisily.

"And where's Ivan?" asked Yurkovsky.

"On watch," said Bykov. He took the pot with the remaining soup and strode heavily towards the hatchway. With pursed lips Yurkovsky watched the stooped figure go.

"My mind's made up, boys," Mikhail Antonovich said in a pitiful voice. "I'm going to start slimming. This won't do. I'm over four hundred and fifty pounds now—the mere thought of it makes me shudder. And that's not the limit. We're still falling a little."

He leaned against the back of his chair, crossing his bloated hands on his stomach. Then he wriggled a little, transferred his hands on to the armrests and almost immediately was asleep.

"Fatty's asleep," Dauge said, turning to look at him. "The ship's aground and the navigator's asleep. One more spoonful, Charles," he said. "For Daddy. That's good. Now for Mummy."

"Excuse me, I can't," Mollard murmured. "I can't. I'll 'lie down." He lay back and started mumbling incoherently in French.

Dauge put the plate on the table.

"Mikhail," he called softly. "Misha."

Mikhail Antonovich snored away.

"Watch me wake him up," said Yurkovsky. "Mikhail," he said softly. "Mussels. Spiced mussels."

Mikhail Antonovich started and woke up. "What?" he mumbled. "What?" "Troubled conscience," said Yurkovsky. Dauge fixed the navigator with his eye. "What are you up to, you in the control room?" he said.

Mikhail Antonovich's red lids blinked, then he shifted in his chair, mumbled faintly: "Oh, I quite forgot..." and tried to get up.

"Stay put," said Dauge.

"What're you up to there?" asked Yurkovsky.

"And what's the ruddy use anyway?"

"Nothing special," Mikhail Antonovich said and looked back at the hatchway. "Nothing, boys, honest. We're just...."

"Misha," said Yurkovsky. "We can see he's up to something."

"Spill the beans, fatty," Dauge said fiercely.

Again the navigator tried to get up.

"Stay put," Yurkovsky said implacably. "Mussels. Spiced mussels. Speak up."

Mikhail Antonovich flushed poppy-red.

"We're not children," said Dauge. "We've faced death before. What the hell are you plotting there?"

"There is a chance," the navigator mumbled faintly.

"There's always a chance," said Dauge. "Be specific."

"A tiny chance," said Mikhail Antonovich. "Really, boys, I must be off."

"What are they doing?" asked Dauge. "What're they so wrapped up in—Alexei and Ivan?"

Mikhail Antonovich looked longingly at the hatchway.

"He doesn't want to tell you," he whispered. "Doesn't want to raise a false hope in you. But he hopes to get us out of this. They're rearranging the magnetic trap system.... And please stop pestering me!" he shouted in a thin voice, struggled up and hobbled to the control room.

"Mon dieu," Mollard said softly and .lay back again.

"Oh, nonsense, straw-clutching," said Dauge; "It's just that Bykov can't sit still with the Old Floorer about to get us. Come on. Come on, Charles, we'll put you in the acceleration absorber. Captain's orders."

Between them they got Mollard on his feet and walked him along the gangway. His head was lolling.

"Mon dieu," he mumbled. "Excuse me. I am a bad space flyer. I am only a radio astronomer."

It was no easy job to drag Mollard along when they had difficulty in walking themselves, but still they got him to his cabin and then into the acceleration absorber. He lay in the oversize box, small, miserable, blue-faced, fighting for breath.

"You'll feel better in a moment, Charles," said Dauge. Yurkovsky nodded and winced with the pain in his back. "Have a rest," he said.

"Good," said Mollard. "Thank you, *camarades."*

Dauge slid the top in place and tapped on it. Mollard tapped back.

"Well, that's that," said Dauge. "I wish we could get a pair of antigrav suits."

Yurkovsky went to the door without saying anything. There were only three such suits on board their ship—*for* her crew. The passengers were expected to take to their acceleration absorbers whenever the G-load was increased.

They made a round of the cabins and collected all the blankets and cushions they could 'lay their hands on. Back in the observation bay they made themselves as comfortable as they could at the two periscopes, then lay back and were silent for a while, resting. Breathing was difficult. They felt as though heavy weights had been laid on their chests.

"Reminds me of the time I had acceleration training," said Yurkovsky. "Had to slim a lot."

"So had I," said Dauge. "But I don't remember much. What's that spiced mussel nonsense?"

"Quite a delicacy, isn't it?" said Yurkovsky. "Our navigator had a few tins stowed away and they went bang in his suit case."

"No," said Dauge. "Not again? What a glutton. What a smuggler. He's 'lucky Bykov's busy."

"Bykov probably doesn't know yet," said Yurkovsky.

And never will, he thought. They fell silent, then Dauge took the observation logs and began leafing through them. They made a few calculations, then had an argument about the meteoric attack. Dauge said it was a stray swarm. Yurkovsky claimed it was a ring. "A ring round Jupiter?" Dauge said contemptuously. 'That's right," said Yurkovsky. "I've suspected one for .a long time. Now it's been proved." "No," said Dauge. "Anyway it's not a ring. It's a half-ring." "Perhaps it is," Yurkovsky agreed. "Kangren's a wizard," said Dauge. "His calculations are amazingly exact." "Not quite," Yurkovsky demurred.

"Why not?" 'asked Dauge.

"Because temperature increases have been markedly slower," Yurkovsky explained.

"That's inner luminescence of a non-classical type," Dauge retorted. "That's just it— non-classical," said Yurkovsky.

"Kangren couldn't have possibly taken account of it," said Dauge.

"But he should," said Yurkovsky. "There have been arguments about it for the last hundred years and lie should have taken it into account."

"You're ashamed, that's all," said Dauge. "You had such a row with Kangren that time in Dublin and now you're ashamed."

"You're a fool," said Yurkovsky.

"Of course you're ashamed," said Dauge.

"I was right," said Yurkovsky. "I took the non-classical effects into account."

"I know," said Dauge. "But if you do," said Yurkovsky, "why don't you stop your nonsense?"

"Don't shout at me," said Dauge. "This is no nonsense. You took the non-classical effects into account all right, but look at the price we're paying for it."

"It's the price you're paying," Yurkovsky said, getting angry. "I see you haven't read my latest paper."

"Well," said Dauge, "don't get shirty. My back's got numb."

"So's mine," said Yurkovsky.

He turned over and got on all fours. It wasn't easy. He reached up to the periscope and glanced into it.

"Have a look," he said.

They looked into the periscopes. The *Tahmasib* was floating in a void filled with a pinkish light. There was absolutely nothing to rest their eyes on. Just an even pinkish light everywhere. It seemed they were looking at a phosphorescent screen. After a long silence Yurkovsky said:

"Rather dull, isn't it?"

He straightened the cushions and lay down again.

"No one has seen this before," said Dauge. "It's metallic hydrogen radiation."

"A fat lot of good such observations will do us," said Yurkovsky. "Suppose we pair a periscope with the spectrograph?"

"Rubbish," Dauge said, hardly able to move his lips. He slid on to the cushions and also lay on his back. "A pity," he said. "To think that no one has ever seen this before."

"I feel just rotten doing nothing," said Yurkovsky. Dauge rose on an elbow suddenly and craned his neck, listening. "What's happened?" Yurkovsky asked.

"Quiet," said Dauge. "Listen."

Yurkovsky listened. A faint low rumbling came from somewhere, changing in volume like a giant bumble-bee buzzing. The rumbling rose in pitch, then died down.

"What's that?" said Dauge.

"I dunno," Yurkovsky said in an undertone. He sat up. "Surely not the engine?"

"No, it's from that side." Dauge waved a hand at the periscopes. "Well now...." They listened and again heard a rumbling sound swelling into a high-pitched buzz, then dying down.

"Must have a look," said Dauge. The giant bumble-bee was silent for a second, then buzzed again. Dauge rose to his knees and buried his face in the periscope frame. "Look!" he shouted.

Yurkovsky crawled to his periscope.

"Just look at that!" Dauge shouted again.

A multitude of huge iridescent spheres were sailing upwards out of the yellowish-pink abyss like so many soap-bubbles. It was a sight of rare beauty. The spheres, all of different sizes, were rising with a low rumbling sound that swelled as they shot past the ship and out of sight. Dauge clutched at the drum of the range-finder. One of the spheres, looking especially huge and pulsating, was passing quite close to them, and, for a moment, the bay reverberated to an unbearably low, sort of nagging rumble and rocked a little.

"Hey, you in the observatory," Bykov was heard on the intercom. "What's that outside?"

"Phenomena," Yurkovsky said, bending his head to the mike.

"What phenomena?" asked Bykov.

"Bubbles of some kind," Yurkovsky explained.

"That much I understand myself," Bykov muttered and cut off.

"This is no longer metallic hydrogen," Yurkovsky said when the last bubbles were gone.

"There," said Dauge. "Diameters of six hundred, ten hundred and three thousand five hundred yards—provided of course there's been no distortion of perspective. That's all I've been able to manage. What could it be?"

Two more bubbles shot past them in the pinkish void outside. A bass rumble swelled and died away.

"That's the planet's mechanism in action," said Yurkovsky. "But we'll never learn its workings...."

"Bubbles in gas," said Dauge. "Not gas really—"it's as dense as petrol."

He turned and saw Mollard sitting in the doorway, his head pressed against the jamb. All the skin on his face seemed to have sagged to his chin under the pull of gravity. His forehead was white and his neck ripe-cherry.

"It's me," he said. Then he turned on his stomach and crawled to his place at the breech. The planetologists looked at him in silence, then Dauge got up, took two cushions—one of his and one of

Yurkovsky's—and made Mollard more comfortable. Nobody said a word.

"Very dull," Mollard said finally. "I can't be alone. I want to talk."

"Delighted to see you, Charles," Dauge said sincerely. "We too find it dull and are talking all the time."

Mollard wanted to sit up but thought better of it and remained lying, breathing heavily, his eye fixed on the ceiling.

"How's life, Charles?" Yurkovsky asked with interest.

"Life's good," Charles said and smiled wanly. "Only short."

Dauge lay down and also Stared at the ceiling. Life's short, he thought. Much too short. He swore in Lettish softly. '"Pardon?" asked Mollard.

"He's swearing," explained Yurkovsky.

Suddenly Mollard said, "My friends!" in a high-pitched voice and the planetologists turned to him.

"My friends!" Mollard repeated. "What shall I do? You're experienced space flyers. You are great men and heroes. Yes, heroes. *Mon dieu!* You faced death more often than I looked into a girl's eyes." He shook his head ruefully on the cushion. "But I am not experienced. I am afraid and I want to talk much, but the end is near and I don't know how."

He was looking at them with bright eyes. Dauge muttered, "Damn," awkwardly and glanced at Yurkovsky. He was lying back, his head cradled in his arms, looking at Mollard out of the corner of his eye.

"I can tell you a story of how I nearly got a leg sawn off," Yurkovsky suggested.

"Excellent," Dauge said happily. "And then you tell us something funny, Charles."

"You are always joking," said Mollard.

"Or we can sing," said Dauge. "It's been done—I read about it somewhere. Can you sing us something, Charles?"

"Sorry," said Mollard. "I've gone to pieces."

"Not in the least," said Dauge. "You're doing fine, Charles. That's the main thing. Isn't Charles doing fine, Vladimir?"

"Of course he is," said Yurkovsky. "Just fine."

"Our captain's not napping," Dauge continued in a cheery voice. "Have you noticed, Charles? He's thought something up, our captain has."

"Yes," said Mollard. "Oh, yes. Our captain is our big hope."

"I should think so," said Dauge. "You just can't imagine how big a hope he is."

"Six-foot-six," said Yurkovsky.

Mollard laughed.

"You are always joking," he said.

"And in the meantime we shall talk and observe," said Dauge. "Want to have a peep in the periscope, Charles? It's beautiful. It's something nobody has ever seen before." He rose and looked into the periscope. Yurkovsky noticed his back arch suddenly. Dauge seized the periscope frame with his both hands. "Good God," he breathed out. "A spaceship!"

A spaceship hung motionless outside. They saw her clearly in all details and she seemed to be at a distance of a mile or so from the *Tahmasib.* She was a first-class photon cargo ship, with parabolic reflector which looked like a hooped skirt, globular living quarters, a flat cargo bay, and three cigarshaped emergency rockets flung far out on brackets. She hung vertically and was completely motionless. And she was grey like a black-and-white film still.

"Who's that?" Dauge mumbled. "Surely not Petrushevsky?"

"Look at her reflector," said Yurkovsky. The reflector of the grey ship was chipped. "They've had bad luck too," said Dauge. "Oh," said Mollard. "There's another one." The second spaceship—an exact replica of the first—hung farther and lower.

"She's got a chipped reflector too," said Dauge. "I've got it," Yurkovsky said suddenly. "It's our *Tahmasib.* A mirage."

It was a double mirage. A string of iridescent bubbles raced upwards and the ghost *Tahmasibs* rippled and vanished. But three more appeared— to the right and higher.

"What beautiful bubbles," said Mollard. "And they sing."

He lay on his back again. His nose had started bleeding and he was blowing it, wincing and glancing at the planetologists to make sure they were not looking. Of course they weren't.

"There," said Dauge. "And you say it's dull."

"I don't," said Yurkovsky.

"Yes, you do," said Dauge. "You keep whining that it's dull."

They both avoided looking at Mollard. The bleeding couldn't be stopped. The blood would congeal of itself. They really ought to get him into his acceleration absorber, but. ... Never mind, it would congeal. Mollard was blowing his nose softly.

"There's another mirage," said Dauge, "but it's not a ship."

Yurkovsky looked in the periscope. No, he thought. It just doesn't make sense. Not here in Jupiter. Slowly gliding below and past the *Tahmasib* was the peak of an enormous grey cliff. Its base was lost in the pinkish haze. Another cliff rose near by, bare, vertical, deep-creviced. A little further there was a whole range of similar sharp sheer peaks. The silence in the observation bay was now filled with creaking, rustling and faint rumbling like echoes of far-off mountain-slides.

"This is no mirage," said Yurkovsky. "This looks like a core."

"Rubbish," said Dauge.

"Perhaps Jupiter has a core after all."

"Stuff and nonsense," Dauge said impatiently.

The mountain range under the *Tahmasib* now stretched as far as they could see.

"Look over there," said Dauge.

Above the jagged peaks a dark silhouette loomed, grew, assumed the shape of a huge fragment of black rock, then disappeared. Immediately another appeared, then a third, while in the distance some roundish grey mass shimmered palely, only just visible. The mountain range, which had been sinking slowly, slipped out of view. Yurkovsky, without taking his eyes off the sight, picked up his mike. In the silence his joints cracked.

"Bykov," he called. "Alexei."

"Alexei's not here, Vladimir," they heard the navigator's voice. The voice was hoarse and faltering. "He's in the engine."

"Mikhail, we're passing over some cliffs," said Yurkovsky.

"What cliffs?" Mikhail Antonovich asked in a frightened voice.

In the distance a huge plain fringed by low hills slid into view and then vanished in the pinkish haze.

"We don't understand it yet," said Yurkovsky.

"I'll have a look right away," said Mikhail Antonovich.

Another mountain range was gliding past them. Its base was far above them and its tops were thrust downwards. It was an eerie, fantastic sight and Yurkovsky took it for a mirage at first, but it wasn't. Then he understood and said, "It's no core, this, Grigory. It's a graveyard." Dauge did not understand. "It's a graveyard of worlds," said Yurkovsky. "Jupe's gobbled them up."

Dauge didn't say anything for a while, then he muttered:

"What discoveries.... Ring, pinkish radiation, graveyard of worlds.... A pity."

He turned and called Mollard. 'There was no answer. He was lying on his face.

They dragged Mollard all the way to his cabin, brought him round there and he instantly fell asleep in the acceleration absorber as though he had fainted. Then they returned to their periscopes. Under the ship, next to her and over her fragments of unborn worlds—mountains, cliffs, huge fissured rocks, grey transparent clouds of dust—swam slowly past in the streams of compressed hydrogen. Then the *Tahmasib* drifted off and the periscopes again showed nothing but a pinkish void all round them.

"I'm fagged out," said Dauge. He turned to lie on his side and his bones cracked. "Hear that?" "Yes," said Yurkovsky. "Let's go on observing." "Yes," said Dauge. "I thought it was a core," said Yurkovsky. "It couldn't be," said Dauge. Yurkovsky rubbed his face with his hands. "That's what you say," he said. "Let's go on."

They were to see and hear much more, or it seemed to them they did, for they were both utterly exhausted and often on the verge of a blackout. Then they were unaware of their surroundings except for the even pinkish light. They saw broad stark zigzags of lightning propped between the darkness overhead and the pinkish haze beneath, and heard the iron clang of the lilac discharges that pulsated in them. They saw quivering films of substance rush hard by with a thin whistle. They watched weird shadows which stirred and moved about, and Dauge argued they were three-dimensional, while Yurkovsky insisted he was just delirious. And they heard howling, and squeaking, and rattling, and strange noises like voices. Dauge suggested they record them, but noticed Yurkovsky was fast asleep, lying on his stomach. He turned Yurkovsky over and was back in his place when through the open door crawled Varya, white-specked blue and dragging her belly, sidled to Yurkovsky and clambered on to his knees. Dauge wanted to shoo her away but found he had no strength left for the effort. He could not even raise his head. Varya's sides heaved heavily and she was blinking. The bosses on her muzzle stood out and her two-foot tail jerked spasmodically in time to her breathing.

3. Time to take leave but the radio astronomer doesn't know how to.

It was hard, unbelievably hard to work under those conditions. Zhilin had had several blackouts. His heart would just stop beating and he would be plunged into a bloody mist. And all the time there was a taste of blood in his mouth. And each time Zhilin was acutely mortified because Bykov worked on untiringly, with the steady rhythm and precision of a machine. He was drenched in sweat, probably found the work just as hard, but apparently was able to retain consciousness by force of will. After two hours Zhilin had lost all understanding of their purpose, all hope and even desire to survive, but after each black-out he picked up where he had left because Bykov was at his side. Once he had come to and there was no Bykov. He wept. But Bykov soon returned, placed a messtin of soup at his side and said, "Eat." He ate and pitched into his work. Bykov's face was white and his neck purple and hanging in folds. He was breathing heavily and hurriedly, his huge mouth wide open. And he never said a word. Zhilin was thinking: if we do break out of this I won't go on any interstellar flights or expeditions to Pluto or anywhere before I am like

Bykov. As ordinary and even dull in times of routine. As morose and even slightly ridiculous. So much so that it was hard to believe in all those stories about the Golconda and Callisto and other places. Zhilin remembered that behind Bykov's back young space flyers would poke fun at the Red-Haired Hermit—incidentally, how did he come by that odd nickname?—but he had never heard a pilot or scientist of Bykov's generation speak slightingly about him. If I come out I must become like Bykov. If I don't I must die like Bykov. When Zhilin blacked out, Bykov stepped over him silently and finished his work. When Zhilin came to, Bykov went silently to his place.

Then Bykov said, "Come on," and they filed out of the magnetic-system chamber. Everything was swimming in front of Zhilin's eyes, he wanted to lie down and bury his nose in something soft and wait until he was picked up. He got stuck in the hatchway following Bykov and lay down after all, his nose pressed against the cold floor, but came to rapidly and saw Bykov's boot close to his face. The boot was tapping impatiently. Must be quite an effort—tapping one's boot with a G-load like this, he thought. Must try it. He made a supreme effort and forced himself through the hatchway. Then he squatted to batten the hatch more securely. The lock wouldn't obey and he clawed at it with his scratched fingers. Bykov towered near by like a radio mast, looking at him steadily from above.

"Just a moment," Zhilin said hurriedly. "Just a. moment." Finally the hatch was locked.

"Ready," Zhilin said and got up. His knees were shaking.

"Come on," said Bykov.

They went back to the control room. Mikhail Antonovich was asleep in his chair at the computer. His lips hung loose and he was snoring. The computer was on. Bykov leaned over the navigator, picked up the mike of the intercom and said:

"All passengers are summoned to the mess-room."

"What?" Mikhail Antonovich asked, startled out of his sleep. "What—already?"

"Yes," said Bykov. "Let's go to the mess room." He didn't go immediately, but stood and absently watched Mikhail Antonovich get out of his chair, grunting and wincing. Then he came to and said, "Come on."

They went to the mess room. Mikhail Antonovich made straight for the sofa, plopped down and folded his arms on his stomach. Zhilin too sat down—to stop his knees shaking—and stared at the table-top. Dirty plates still stood in a pile on it. Presently the door opened and in stumbled the passengers. The planetologists had Mollard between them. He hung limply, dragging his feet and clutching at their shoulders. In his hand he had a balled handkerchief covered with dark spots.

In silence Dauge and Yurkovsky seated Mollard on to the sofa and sat down on either side of him. Zhilin ran his eye over them all. What horrible mugs, he thought. Surely I can't look like them? He touched his face stealthily. His cheeks felt very thin, while his chin seemed as thick as Mikhail Antonovich's. He felt pins and needles in his face. As if I've been sitting on it, he thought.

"Well," said Bykov. He got up from a chair in a corner, went to the table and leaned on it heavily. Mollard gave Zhilin a sudden wink and covered his face with the spotted handkerchief. Bykov glanced at him coldly. Then he rested his glance on the opposite wall.

"Well,", he repeated. "We have finished refitting the *Tahmasib.* We can now use the photon propulsion unit and that is precisely what I have decided to do. However -I should like first to let you into all possible consequences. I warn you the decision's final and I'm not proposing to consult you and ask for your opinions."

"Please make it shorter, Alexei," said Dauge.

"The decision is final," said Bykov. "But I consider you're entitled to know how it might end. First, the reactor's activation might touch off an explosion in the compressed hydrogen round us. And that would mean the *Tahmasib's* total destruction. Second, the plasma's first flash might destroy the reflector—the outer surface of the mirror's probably whittled away by corrosion by now. Then we'd stay here and.... It's clear what that would mean. Third, the *Tahmasib* might fight her way out of Jupiter and—"

"That's clear," said Dauge.

"And the food would be delivered to Amaltheia," said Bykov.

"For which the food would be eternally grateful to Bykov," said Yurkovsky. Mikhail Antonovich smiled wanly. He didn't find it funny.

Bykov was looking at the wall.

"I'm giving the start right away," he said. "The passengers are requested to take their places in the acceleration absorbers. All of you. And without any of your tricks," he glanced at the planetologists. "It's going to be eight G's. If not more. Carry out orders.

Engineer Zhilin, check on compliance and report to me."

He ran his eye over them, then turned and strode into the control room.

"Mon dieu;' said Mollard. "What a life."

His nose was bleeding again. Dauge jerked his head and said:

"We need someone who's lucky. Any lucky dog among you? We absolutely need someone who's lucky."

Zhilin got up.

"It's time. Comrades," he said. He wished everything would soon be over. He desperately wished everything was over and done with. They had all remained seated. "It's time, Comrades," he repeated in confusion.

"There's about ten per cent of probability of a favourable result," Yurkovsky said musingly and started rubbing his cheeks. Mikhail Antonovich grunted and struggled up out of the sofa.

"Boys," he said. "Looks we ought to bid farewell to one another. Just in case, you know. Anything might happen." He smiled piteously.

"We might as well," said Dauge. "Yes."

"And I again don't know how," said Mollard.

Yurkovsky rose.

"I'll tell you what," he said. "Let's go and get into the acceleration absorbers. Bykov might come any moment and then—I'd prefer to be burned up. He's a heavy hand—I remember to this day, though it was ten years ago...."

"Quite," Mikhail Antonovich said and fussed. "Come on, boys, come on.... But let me kiss you first."

He kissed Dauge, then Yurkovsky, then turned to Mollard and kissed him on the forehead.

"Where will you be, Misha?" asked Dauge.

Mikhail Antonovich kissed Zhilin, gave a little sob and said:

"In the acceleration absorber—same as everyone."

"And you, Vanya?"

"Me too," said Zhilin. He was holding Mollard by his shoulders.

"And the captain?"

They were in the gangway now and everyone stopped. There were a few more steps before separation.

"Alexei Petrovich says he doesn't trust automation inside Jupe," said Zhilin. "He'll steer her himself."

"Just like Bykov," Yurkovsky said with a wry smile. "A knight in shining armour."

Mikhail Antonovich gave a little whimper and headed for his cabin.

"Let me help you. Monsieur Mollard," said Zhilin.

"Please," Mollard said and Obediently clutched at Zhilin's shoulder.

"Good luck and quiet plasma," said Yurkovsky. Dauge nodded and they parted. Zhilin led Mollard to his cabin and helped him into the absorber.

"How's life, Vanya?" Mollard asked sadly. "Good?"

"Good, Monsieur Mollard," said Zhilin.

"And how are the girls?"

"Very good," said Zhilin. "There're nice girls on Amaltheia."

He smiled politely, slid the top in place and switched off the smile. I wish it was all over, he thought. He walked the length of the gangway and it looked very bare to him. He tapped on each shock-absorber, got the replies and went back to the control room.

Bykov sat in the senior pilot's place. He was in an antigrav suit. It looked like a silk worm's cocoon, from one end of which a mop of red hair was sticking out. The face was as ordinary as always, only sterner and very tired. \ "All set, Alexei Petrovich," said Zhilin.

"Good," said Bykov. He glanced at Zhilin sideways. "Not afraid, youngster?"

"No," said Zhilin. He wasn't afraid. He only wished it would all be over soon. And then he suddenly wished to see Father as he used to emerge out of his spaceship after a long trip, stout, moustachioed, helmet in hand. And to introduce Father to Bykov.

"Go, Ivan," said Bykov. "I give you ten minutes."

"Quiet plasma to you, Alexei Petrovich," said Zhilin.

"Thanks," said Bykov. "Go."

I must bear it out, Zhilin thought. Surely I will bear it out. He was at the door of his cabin when he spotted Varya. Varya was crawling laboriously, hugging the wall, dragging her wedge-shaped tail. Catching sight of Zhilin she raised her triangular muzzle and winked slowly.

"You poor beast," said Zhilin. He seized her by the loose skin on her neck, dragged her inside, slid open the top of his acceleration absorber and looked at his watch. Then he threw Varya into the box—she felt very heavy as she quivered in his hands—and got in himself. He lay back in complete darkness and listened to the gurgling of the absorber mixture while his body was becoming lighter and lighter. It was very pleasant, only Varya kept jerking at his side, her bosses prickling his hand. I must bear it out, he thought. Like he does.

In the control room Bykov jabbed at the ribbed key of the starter with his thumb.

EPILOGUE

J-STATION, AMALTHEIA

The chief of the Station has no eye for the setting Jupiter and Varya gets her tail pulled.

'The setting of Jupiter is also a spectacular sight. The yellowish-green exospheric glow dies out and stars flicker up one after another in the darkening sky like diamond needles against black velvet.

But the chief of the J-Station saw neither the stars nor the yellowish-green glow above the cliffs. His eyes were on the icy field of the spacedrome. Just where the colossal tower of the *Tahmasib* was falling slowly, in a barely perceptible movement. The first-class cargo photon ship was indeed colossal. It was so huge it even dwarfed the bluish-green plain pitted with black round spots it was falling on. From the spectrolite dome it seemed the ship was free-coasting. But in real fact it was being towed into place. Hidden in the shadows of the cliffs on the sides of the field there were powerful winches, and bright filaments of hawser would sometimes sparkle into view in the sun's rays. The sun shone full on the ship and she was all in sight, from the huge bowl of the reflector to the globe of the living quarters.

Never before had so badly damaged a ship come to Amaltheia. The reflector was cracked on the edge so that there was a dense distorted shadow in the huge bowl. The six-hundred-foot tube of the photon reactor looked mottled as though eaten away by scab. The emergency rockets protruded at awkward angles on the twisted brackets, the cargo bay was lop-sided and looked like a round tin that had been trodden on by a magnetic boot. Part of the food has perished, thought the chief. What nonsense I'm thinking. As though that mattered. But one thing's certain: the *Tahmasib* is going to stay here for a while.

"Quite a price to pay for chicken broth," said Uncle Hoak.

"Yes," the chief muttered. "Chicken broth. Stop it, Hoak. You don't really mean it."

"Why not?" said Hoak. "The boys could do with some chicken broth."

The spaceship settled on the plain and was lost in the shade. Only the ship's titanium sides glowed a faint green, then there were pin-points of light and the fuss of tiny black figures. Jupiter's shaggy hump dipped behind the cliffs and they darkened and became taller, and a gorge was lit bright for an instant, revealing the trellis-work of the antennae.

The radiophone in the chief's pocket sang mosquito-like. He got the smooth case out and pressed reception.

"Listening," he said.

The switchboardman's tenor—gay, with no diffidence—came to him in a rattle:

"Comrade chief, Captain Bykov's arrived with crew and passengers and is waiting for you in your office."

"Coming," said the chief.

Together with Uncle Hoak he took the lift down and went to his office. The door was wide open. The room was full of people who all 'spoke and laughed loudly. Still in the gangway the chief heard a gay yell:

"How's life—good? How're the boys— good?"

The chief lingered in the doorway, his eyes searching for the newcomers. Hoak was breathing noisily just behind him and the chief knew he was grinning from ear to ear. It would be interesting to look at a grinning Hoak, but the chief didn't turn. He saw Mollard, his hair wet after a bath. The Frenchman was gesticulating wildly and laughing his head off. There were girls round him, Zoya, Galya, Nadya, Jane, Yuriko—in fact, all the Station's girls—who were laughing heartily too. Mollard had a way of gathering all the girls round him. Then the chief spotted Yurkovsky, or rather the back of his head, and a nightmarish monster on his shoulder. The monster was jerking its head here and there and yawning horribly, while a few daredevils kept pulling at its tail. Dauge was not in sight but could be heard as easily as Mollard. He was yelling: "Hands off! Let me go! Ah-ah!" A huge young fellow he did not know was standing to the side, very handsome and very pale compared with the group of local space flyers with whom he was engaged in a lively conversation. Mikhail Antonovich Krutikov was sitting in a chair beside the chief's desk. He was talking away, waving his short pudgy hands and sometimes pressing a balled lace-trimmed handkerchief to his eyes.

Only then did the chief recognise Bykov. He was pale to the point of blueness and there were bluish bags under his bloodshot eyes that spoke of prolonged exposure to high acceleration. Round him stood department chiefs and the chief of the spacedrome. He was speaking to them, but in so low a voice that the chief could not understand a word and only saw his lips move slowly in the effort of speech. This was the quietest group in the room. Presently Bykov looked up and saw the chief. He got up, a whisper ran around and there was a general hush.

They both moved at the same time, their magnetic soles clanging against the metal floor, and met in the middle of the room. They shook hands and stood for a while silently and motionlessly. Then Bykov disengaged his hand and said:

"Comrade Kangren, I report the spaceship *Tahmasib* with its cargo."

Kirill Stanyukovich (b. 1911), professor of geobotany, has written numerous books on his subject, both for the specialist and the layman. In "The *Golub-Yavan*", first published in 1959, the author shares with the reader his abundant experience of years spent in the Pamir Mountains.

Mikhail Vasilyev (b. 1920), a qualified engineer, is now a full-time journalist. His popular-science books *Space Travel, Man and Energy, Reports from the 21st Century* (written in collaboration with S. Gushchev) have been translated into many languages. At present he is the science and technology editor of the youth daily *Komsomolskaya Pravda.*

Arkady and *Boris Strugatsky*, authors of "Destination: Amaltheia", have already several collections of SF stories to their credit. Arkady Strugatsky (b. 1925) is a linguist and translator specialising in Japanese. Boris (b. 1933) is an astronomer and works at the computer laboratory of Pulkovo Observatory. The title story of this volume is their second novelette appearing after "The Country of the Purple Clouds"—about explorations on Venus, First Prize winner in a best SF book competition.

Valentina Zhuravlyova (b. 1933) received her training at a medical institute. She was probably prompted to try her hand at scientific fiction by the almost fantastic possibilities offering in the field of medicine. The reader will particularly enjoy the bold flights of fancy in her scientific thinking. "The Astronaut"—1960—is one of her latest creations.

Alexander Belayev (1884-1942), a notable writer of science fiction with a hard and amazing life story. For years tuberculosis of the spine kept him confined to his bed, yet he was able to enjoy a full and interesting life. He studied law, attended the conservatoire, worked on newspapers and periodicals and was deeply interested in science and technical problems. Belayev produced a big selection of science-fiction books: *The Amphibian* (published by FLPH), *Professor Dowell's Head, The Island of Dead Ships, The Last Man from Atlantis, A Jump into Nothingness*, and others.

Anatoly Dnieprov (b. 1919), the author of "The Maxwell Equations", which he wrote in 1960, is a distinguished physicist who works at an institute of the U.S.S.R. Academy of Sciences. His favourite subject is cybernetics—its amazing achievements to date and its breath-taking potentialities. Scientific authenticity is a salient feature of his writings.

Igor Zabelin (b. 1927) is a geographer by profession, specialising in the theory of physical geography. Far from being the armchair scientist type he has explored the remotest areas of the Soviet Union, such as Tuva, Buryatia, Chukotka and Tien Shan, where he collected a wealth of material for his spare-time writing. He delights in depicting the hard and adventurous life of geographers and pioneers and unravelling the mysteries of lost expeditions—as he does in his "Valley of the Four Crosses" which is included in this volume.